Public Works Canada
Travaux publics Canada

Solar Programs Office
Bureau des programmes solaires

Solar Programs Office

APPROVED SOLAR PRODUCTS (Collectors and Packaged Systems)

1 November 1984
(supersedes: 1 June 1984)

This document contains two sections: 1. - Solar Collectors and 2. - Packaged Solar Systems.

Each section has a cover sheet, a product index and information on the products listed in alphabetical order.

The document is updated monthly and changes will be issued on the first of every month to the extent required.

Changes, additions and deletions to previous lists are shown in bold type.

Information:

Product Engineering Section
Solar Programs Office
Public Works Canada
Confederation Heights
Ottawa K1A 0M2

R. Saunders (613) 998-3940
L. Emerton (613) 998-3643

SECTION 1
APPROVED
SOLAR COLLECTORS

1 November 1984

(supersedes: 1 June 1984)

The attached lists of SPO Approved Solar Collectors and options include the most recent available data which should be used for all system design calculations.

Information:

Product Engineering Section
Solar Programs Office
Public Works Canada
Confederation Heights
Ottawa K1A 0M2

R. Saunders (613) 998-3940
L. Emerton (613) 998-3643

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Effective Date: **1 November 1984** (supersedes: 1 June 1984)

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4.	General Solar	LFP	GS50-R-A
5.	LPC	AFP	406
6.	Norsun	LFP (Innovative)	TD-2000-30
7.	Norsun	LFP (Innovative)	TD-3000-30
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10.	Petro-Sun	LFP	ECIM
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28.	Watershed	AFP	A-100

LEGEND:

AFP	Air, Flat Plate
ETC	Evacuated Tube Collector
GLP	Glazed, Liquid, Plastic
LFP	Liquid, Flat Plate
RFP	Refrigerant-Filled, Flat Plate
ULP	Unglazed, Liquid, Plastic

INNOVATIVE:
Not within the scope of CSA Standard F-378, 1982

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

CONSERVAL

7.5' X 9' GLAZED AIR FLAT PLATE

MODEL DOFASCO

SITE BUILT

MAKE - UP AIR ONLY

NSTE TEST REPORT - NOVEMBER 1981

Fr TA = 29 TEST FLOW RATE : .045 kg/sec

Fr U_L = 3.88 TEST FLUID : air

NSTE TEST REPORT - NOVEMBER 1981

Fr TA = .38 TEST FLOW RATE : .087 kg/sec

Fr U_L = 5.37 TEST FLUID : air

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K										

NOTE : For information or simulation procedures contact SPO System Engineering Section at 998-3643

DIMENSIONS

2770mm X 2260mm X 190mm

Gross Area: 6.26 m^2

Net Area: 4.43 m^2

Weight: 31 kg

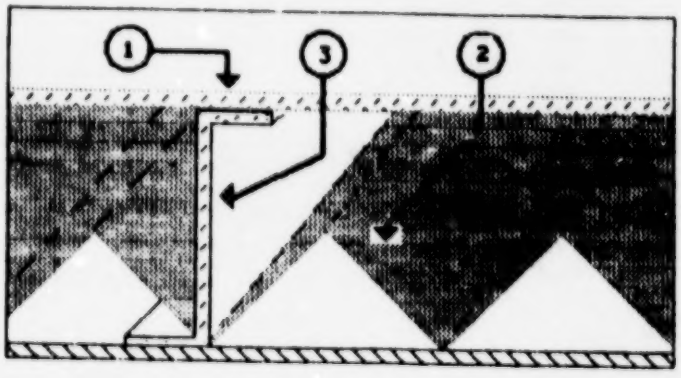
MANUFAC. RECOMMENDATIONS

Flow: 10 to 50 l/sec per m^2

Pressure: .05 to .1 kPa (.25 max)

Max. Oper. Temp. : 85 °C

Heat Transfer Fluid: air



GLAZING (1)

Single glazing of tempered glass, thickness of glazing = 5 mm.

ABSORBER (2)

Industrial aluminum (.1mm thick) is formed into a " V" configuration and coated with silicone based black coating(9149 Solar Coating) with absorbtivity = .97, emissivity = .83

INSULATION

Collector is site built and relies on the building insulation.

CONTAINER

Galvanized steel "Z" (3) channels are mounted vertically to existing building.

GASKETS

None required.

OPTIONS :

No options.

CONSERVAL ENGINEERING INC., 855 Alness St., Suite 1
Downsview, Ontario, M3J 2H8, (416) 661 - 7057

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

CONSERVAL — **MODEL SBA**

2' X 8' GLAZED AIR FLAT PLATE — **SITE BUILT**

DOFASCO ABSORBER ONLY — **MAKE - UP AIR ONLY**

NSTE TEST REPORT - APRIL 1983

Fr TA = .59 TEST FLOW RATE : .045 kg/sec

Fr U_L = 10.61 TEST FLUID : air

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.96	.79	.58

NOTE : For information or simulation procedures contact SPO System Engineering Section at 998-3643

DIMENSIONS

2442mm X 612mm X 190mm

Gross Area: 1.49 m^2

Net Area: 1.26 m^2

Weight: NA

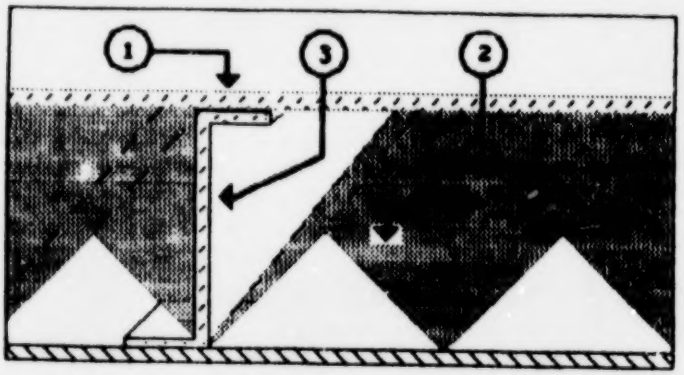
MANUFAC. RECOMMENDATIONS

Flow: 10 to 50 l/sec per m^2

Pressure: .05 to .1 kPa (.25 max)

Max. Oper. Temp. : 85 ^{o}C

Heat Transfer Fluid: air



GLAZING (1)

Single glazing of fiberglass (Excelclad), thickness of glazing = .8 mm, polyester film applied to both sides, U.V. stabilized, requires a coating of acrylic lacquer every 10 to 15 years for U.V. prtection

ABSORBER (2)

Industrial aluminum (.1mm thick) is formed into a " V" configuration and coated with silicone based black coating(9149 Solar Coating) with absorbtivity = .97, emissivity = .83

INSULATION

Collector is site built and relies on the building insulation.

CONTAINER

Galvanized steel "Z" (3) channels are mounted vertically to existing building.

GASKETS

None required.

OPTIONS :

No options.

CONSERVAL ENGINEERING INC., 855 Alness St., Suite 1
Downsview, Ontario, M3J 2H8(416) 661 - 7057

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

GENERAL SOLAR — MODEL GS50-R-C

16' X 32' GLAZED LIQUID FLAT PLATE — SITE BUILT
(STRUCTURE NOT INCLUDED)

NSTE TEST REPORT - MAY 1984

Fr TA = .73 — TEST FLOW RATE : .031 kg/sec
Fr U_L = 5.08 — TEST FLUID : glycol/water

Fr TA = .75 — TEST FLOW RATE : .062 kg/sec
Fr U_L = 5.25 — TEST FLUID : glycol/water

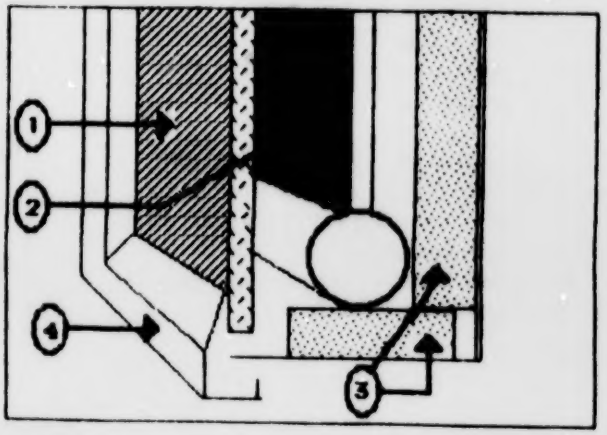
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*.99*	.95	*.93*	.90	*.82*	.70	*.55*

NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS (TEST SPECIMEN)
2497mm X 1223mm X 98mm
Gross Area: 3.05 m^2
Net Area: 2.79 m^2
Weight: NA

MANUFAC. RECOMMENDATIONS
Flow: .33 to 1.33 l/sec per collector
Pressure: 135 to 270 kPa (862 max)
Max Oper. Temp. : 240 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing with 16 sheets of low iron tempered glass (Solatex 1); thick = 3.2 mm

ABSORBER (2)

Parallel riser tubes (9.5 mm, copper) ultasonically bonded to copper fins and brazed with silfos welding rods to copper headers (54 mm copper) Coating is Black Nickel selective anodized surface with absorbtivity = .95, emissivity = .10

INSULATION (3)

Sides : 13 mm rigid, double foil-faced, high temp, polyisocyanurate foam (RSI = .7, k = .709 W/m^2C)
Back : 25 mm polyisocyanurate foam as above RSI of back = 1.4

CONTAINER (4)

Aluminum frame - site assembled.

GASKETS

EPDM gaskets, silicone caulking is also used.

OPTIONS :

(a) GS50-G-C, Ground mounted version

GENERAL SOLAR INC., 150 Mill Street
Carleton Place, Ontario, K7C 3P4, (613) 257 - 7021

SRCC APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

GENERAL SOLAR — MODEL GS50-R-A

16' X 32' GLAZED LIQUID FLAT PLATE — SITE BUILT
(STRUCTURE NOT INCLUDED)

NSTF TEST REPORT - MAY 1984

Fr TA = .73 — TEST FLOW RATE : .062 kg/sec
Fr U_L = 5.12 — TEST FLUID : glycol/water

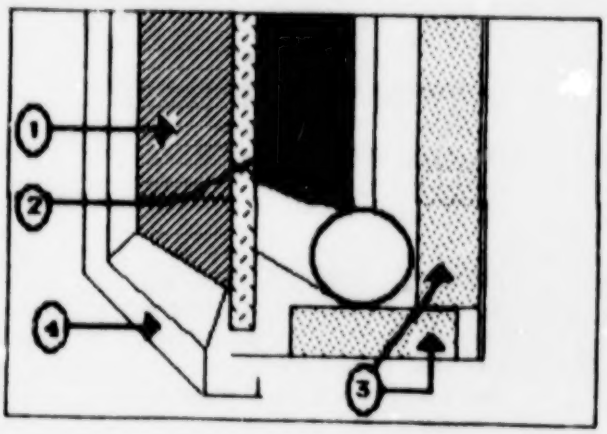
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*.99*	.96	*.94*	.91	*.84*	*.74*	*.59*

NOTE : Use values in italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS (TEST SPECIMEN)
2497mm X 1223mm X 98mm
Gross Area: 3.05 m^2
Net Area: 2.79 m^2
Weight: NA

MANUFACTURER RECOMMENDATIONS
Flow: .058 to .23 l/sec per collector
Pressure: 1335 to 270 kPa (862 max)
Max. Oper. Temp. : 240 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)
Single glazing with 16 sheets of low iron tempered glass (Solatex 1); thick = 3.2 mm

ABSORBER (2)
8 parallel CIM-2-A absorbers using the "Sunstrip" aluminum absorber with the integral copper waterway, the headers are connected with solid copper couplings and 95/5 solder. Coating is Black Nickel selective surface with absorbtivity = .95, emissivity = .15

INSULATION (3)
Sides : 13 mm rigid, double foil-faced, high temp, polyisocyanurate foam (RSI = .7, k = .709 W/m^2C)
Back : 25 mm polyisocyanurate foam as above RSI of back = 1.4

CONTAINER (4)
Aluminum frame - site assembled.

GASKETS
EPDM gaskets, silicone caulking is also used.

OPTIONS :
(a) GS50-G-A, Ground mounted version

GENERAL SOLAR INC., 150 Mill Street
Carleton Place, Ontario, K7C 3P4, (613) 257 - 7021

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

LPC — **MODEL 406**

4' X 10' DOUBLE GLAZED — **AIR FLAT PLATE**

NSTE TEST REPORT - MAY 1982

Fr TA = .51 TEST FLOW RATE : .085 kg/sec

Fr U_L = 6.32 TEST FLUID : air

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*.98*	.95	*.93*	.91	*.87*	*.76*	*.58*

NOTE (Use values in Italics for simulation programs limited to 5 value inputs. (Some programs may use all values except at 45°)

DIMENSIONS

3067mm X 1249mm X 92mm

Gross Area: 3.83 m^2

Net Area: 3.42 m^2

Weight: 43 kg

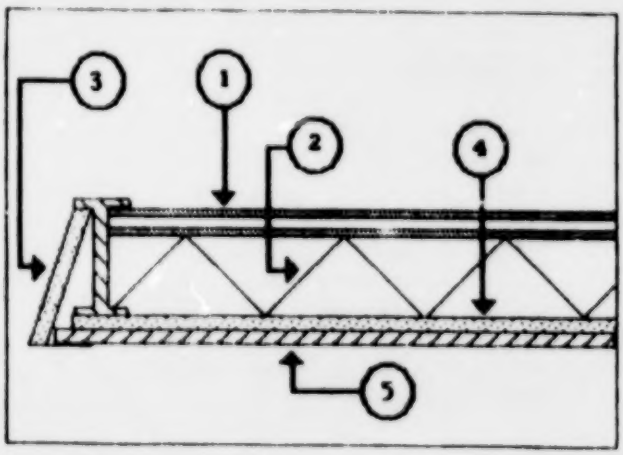
MANUFAC. RECOMMENDATIONS

Flow: 47 l/sec per collector

Pressure: .025 kPa (.125 max) Air Flow Static Pressure

Max. Oper. Temp. : 150 °C

Heat Transfer Fluid: air



GLAZING (1)

Double glazing of fiberglass (Sun-Lite Premium II), thickness of each glazing = 1.02mm, U.V. inhibitor applied at factory.

ABSORBER (2)

Sheet steel (.178mm thick) is formed into a "Deep - V" configuration and coated with non-selective black paint (Polyceram 115) with absorbtivity = .95, emissivity = .84, with an aluminum backing plate (.381mm thick) to make the flow channels.

INSULATION

Sides : 13 mm polyether urethane foam (open cell) (3) (RSI = .7)

Back : 15 mm polyisocyanurate foam (4) between the absorber and the backplate RSI of back = .786, k = .709 W/m^2°C

CONTAINER

U - shaped textured sheet steel (.787mm thick) to cover ends and sides. (5)

GASKETS

Silicone sealant adhesive caulk compound used.

OPTIONS :

(a) Nom Size 4' X 8' ; Gross Area = 2.97 m^2 (Use above performance parameters)

LPC CANADA LTD., P.O. Box 90

Sprague, Manitoba, R0A 1Z0, (204) 437 - 2123

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

NORSUN — MODEL Q'SOL TD 2000-20

3' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - SEPTEMBER 1984

Fr TA = .62 TEST FLOW RATE : 0.1 kg/sec

Fr U_L = 3.87 TEST FLUID : water

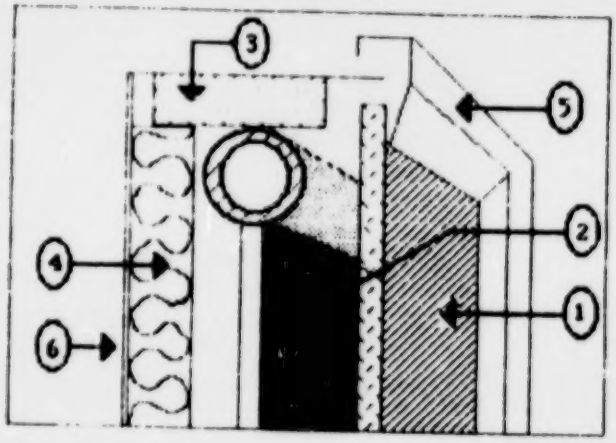
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K										

(Parameters applicable at 900 W/m^2 At other irradiance levels use the equation:

Qcalc = 88.08 + 0.695 (I) - 1.84 (T) - 0.026 (T) (T)

Please contact SPO (System Engineering Section) at 998-3643 for procedure)



DIMENSIONS

2477mm X 899mm X 140mm

Gross Area: 2.23 m^2

Net Area: 2.04 m^2

Weight: kg

MANUFAC. RECOMMENDATIONS

Flow: .027 l/sec per collector

Pressure: 413 kPa (861 max)

Max. Oper. Temp. : 205 °C

Heat Transfer Fluid: any fluid chemically compatible with copper

GLAZING (1)

Single glazing of low iron tempered glass (Heliolite), thick = 3.0 mm

ABSORBER (2)

Parallel riser tubes (9.5 mm, type L copper) ultasonically bonded to hard copper fins (101 mm X 25 mm) and brazed with silfos welding rods to a copper header (38.1 mm, type M copper) Coating is Black Chrome with absorbtivity = 95, emissivity = 10. a copper heat exchanger tube (19 mm, type L copper) passes through the header, a non-freezing, non-toxic chemically inert fluid is sealed into the tube grid and the system fluid to be heated passes through the heat exchanger

INSULATION

Sides : 19 mm rigid, foil-faced, high temp, polyisocyanurate foam (3) (RSI = .88, k = .709 W/m^2C)

Back : 76 mm Fiberglas AW Wool Type 1 and/or spun glass (4) (RSI of back = 2.1, k of fiberglass = .768 W/m^2C)

CONTAINER

Extruded aluminum frame (5) (alloy 6063) and aluminum backing sheet (6) (.64 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber, silicone caulking is used to seal the container corners

OPTIONS .

(a) TD 2000-30, -40, -50, with headers 30,40 and 50 mm respectively

NORSUN, P. O. Box 288

Manotick, Ontario, K0A 2N0, (613) 692 - 2513

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

NORSUN — MODEL Q'SOL TD 3000-30

4' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - NOVEMBER 1982

Fr TA = .67 TEST FLOW RATE 0.136 kg/sec

Fr U_L = 4.57 TEST FLUID water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K										

(Parameters applicable at 900 W/m^2. At other irradiance levels use the equation:

Qcalc = -56.26 + 0.708 (I) - 2.56 (T) - 0.025 (T) (T)

Please contact SPO (System Engineering Section) at 998-3643 for procedure)

DIMENSIONS

2481mm X 1214mm X 140mm

Gross Area: 3.01 m^2

Net Area: 2.79 m^2

Weight: kg

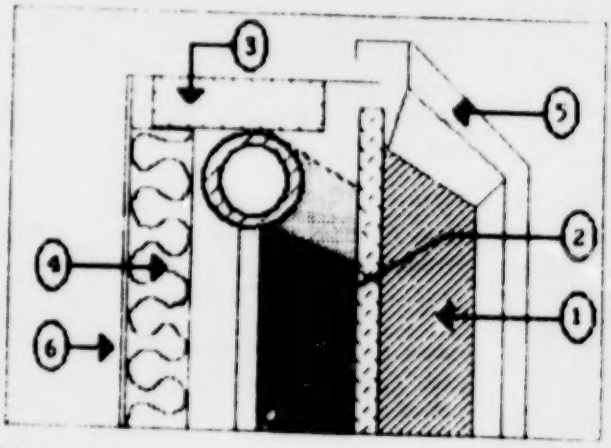
MANUFAC. RECOMMENDATIONS

Flow: .027 l/sec per collector

Pressure: 413 kPa (861 max)

Max. Oper. Temp : 205 °C

Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite), thick = 3.0 mm

ABSORBER (2)

Parallel riser tubes (9.5 mm, type L copper) ultasonically bonded to hard copper fins (101 mm X .25 mm) and brazed with silfos welding rods to a copper header (38.1 mm, type M copper). Coating is Black Chrome with absorbtivity = .95, emissivity = .10. a copper heat exchanger tube (19 mm, type L copper) passes through the header, a non-freezing, non-toxic, chemically inert fluid is sealed into the tube grid and the system fluid to be heated passes through the heat exchanger

INSULATION

Sides : 19 mm rigid, foil-faced, high temp. polyisocyanurate foam (3) (RSI = .88, k = .709 W/m^{2}C)

Back : 76 mm Fiberglas AW Wool Type 1 and/or spun glass (4) (RSI of back = 2.1, k of fiberglass = .788 W/m^{2}C)

CONTAINER

Extruded aluminum frame (5) (alloy 6063) and aluminum backing sheet (6) (.64 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber, silicone caulking is used to seal the container corners

OPTIONS .

No options.

NORSUN, P. O. Box 280

Manotick, Ontario, K0A 2N0, (613) 692 - 2513

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN

MODEL CIM-2-C

4' X 8' GLAZED LIQUID FLAT PLATE

NSTF TEST REPORT - OCTOBER 1981

Fr TA = .69 TEST FLOW RATE : .059 kg/sec

Fr U_L = 5.21 TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	1.0	.98	*.97*	.94	.85	.73	.54.

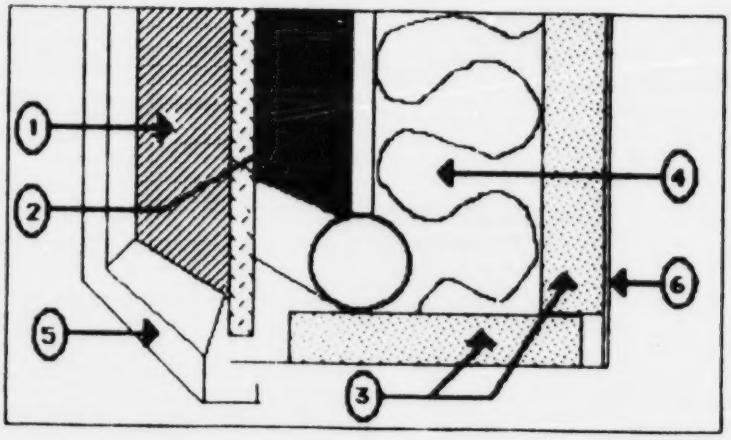
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2473mm X 1270mm X 102mm
Gross Area: 2.98 m^2
Net Area: 2.78 m^2
Weight: 69 kg

MANUFAC. RECOMMENDATIONS

Flow: .04 to .13 l/sec per collector
Pressure: less than 200 kPa for drainback
135 to 270 kPa for closed loop
(862 max)
Max. Oper. Temp. : 240 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite), thick = 4.75 mm

ABSORBER (2)

8 parallel riser tubes (9.5 mm, type M copper) high frequency welded to copper fins (11.4mm X .25 mm) and connected to copper headers (25 mm, type L copper) Coating is electroplated black chrome with absorbtivity = NA, emissivity = NA

INSULATION

Sides : 25 mm rigid, high temp. phenol formaldehyde foam (Esfen) (3) (RSI = .7)
Back : 15 mm foam (3) as above with 25 mm low-binder fiberglass (4) between the absorber and the foam, total RSI of back = 1.8, k of fiberglass = .788 W/m^2C

CONTAINER

Extruded aluminum frame (5) (alloy 6063) and aluminum backing sheet (6) (.38 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber

OPTIONS :

(a) CIM-1-C one inch header
(b) STM 3' x 6.5' collector, area = 1.82 m^2

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670 - 8043

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN

MODEL CIM-1-A

4' X 8' GLAZED LIQUID FLAT PLATE

NSTF TEST REPORT - OCTOBER 1982

Fr TA = .73 TEST FLOW RATE : .066 kg/sec

Fr U_L = 4.59 TEST FLUID : water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	1.0	.98	*.96*	.93	.85	.74	.55

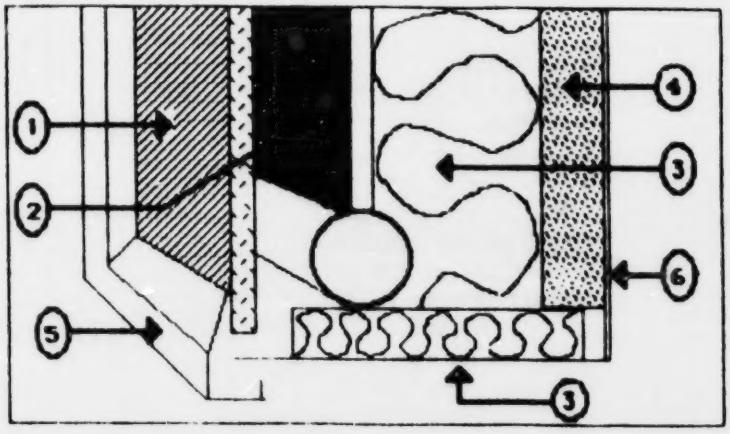
NOTE : Use values in italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2473mm X 1270mm X 102mm
Gross Area: 3.0 m^2
Net Area: 2.78 m^2
Weight: 65 kg

MANUFAC. RECOMMENDATIONS

Flow: .04 to .13 l/sec per collector
Pressure: less than 200 kPa for drainback
135 to 270 kPa for closed loop
(862 max)
Max. Oper. Temp. : 240 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite), thick = 4.75 mm

ABSORBER (2)

8 parallel aluminum fins with an integral copper waterway (Sunstrip), the riser is connected to the header with a short nipple silver soldered to the absorber and brazed to the header (25 mm, type M copper), coating is selective black nickel with absorbtivity = .95, emissivity = .15

INSULATION

Sides : 25 mm fiberglass (AF 530) (3) (RSI = .7), k = .788 W/m^2C
Back : 25 mm fiberglass (3) as above with 19 mm foil-faced foam (Urate) (4) between the fiberglass and the back, total RSI of back = 1.8

CONTAINER

Extruded aluminum frame (5) (alloy 6063) and aluminum backing sheet (6) (.76 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber, silicone caulking is used as corner sealant

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OPTIONS :

(a) CIM-2-A two inch header
(b) SCIM 4' x 6' collector, area = 2.25 m^2

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670 - 8043

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN

MODEL ECIM

4' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - DECEMBER 1982

Fr TA = .74 TEST FLOW RATE : .066 kg/sec

Fr U_L = 4.98 TEST FLUID : water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	.98	.97	*.95*	.94	.88	.80	.65

NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2473mm X 1206mm X 79mm

Gross Area: 2.99 m^2

Net Area: m^2

Weight: kg

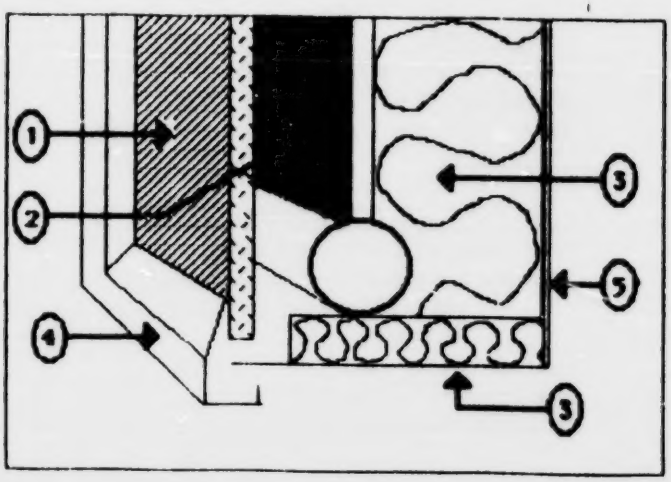
MANUFAC. RECOMMENDATIONS

Flow: .055 to .10 l/sec per collector

Pressure: less than 200 kPa for drainback
135 to 270 kPa for closed loop
(862 max)

Max. Oper. Temp. : 240 °C

Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite), thick = 4.75 mm

ABSORBER (2)

8 parallel aluminum fins with an integral copper waterway (Sunstrip), the riser is connected to the header with a short nipple silver soldered to the absorber and brazed to the header (25 mm, type M copper), coating is selective black nickel with absorbtivity = .95, emissivity = .15

INSULATION (3)

Sides : 25 mm fiberglass with organic binder (RSI = .7) , k = .788 W/m^2C

Back : 25 mm fiberglass as above

CONTAINER

Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5) (.81 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber, silicone caulking is used as corner sealant

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OPTIONS :

(a) ESV 4' x 6' collector, area = 2.25 m^2

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670 - 8043

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN — MODEL THEMO-SOLAR PLASTIC

4' X 10' GLAZED LIQUID PLASTIC

NSTE TEST REPORT - JUNE 1981

Fr TA = .50 — TEST FLOW RATE : .035 kg/sec

Fr U_L = 10.68 — TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	.98	.95	*.92*	.87	*.84*	.80	*.67*	.52	*.40*

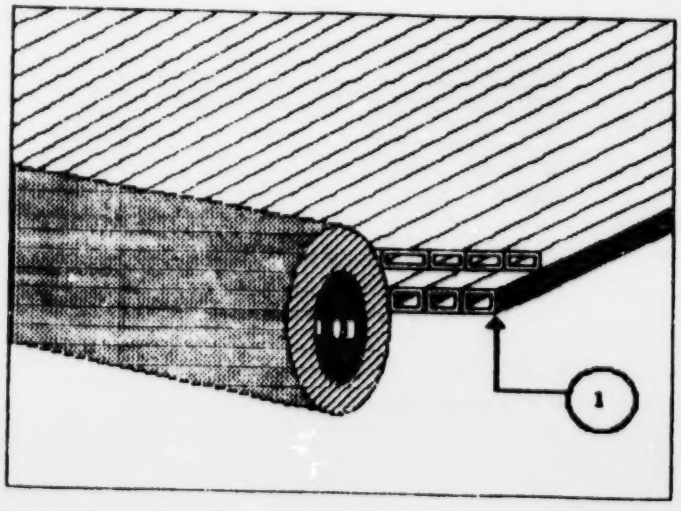
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

3000mm X 1200mm
Gross Area: 3.93 m^2
Net Area: m^2
Weight: kg

MANUFAC. RECOMMENDATIONS

Flow: .2 to .67 l/sec per collector
Pressure: 30 to 120 kPa (140 max)
Max. Oper. Temp. : 60 °C
Heat Transfer Fluid: water, chlorine or salt water



GLAZING (1)

Single glazing of translucent extruded double wall plastic sheet, U. V. stabilized, thick = 5.0 mm

ABSORBER (2)

Absorber is extruded black plastic sheet with internal channels which are bonded to headers with a heat seal . Absorber consists of 220 flow channels. Absorber materials are polypropylene and polyethylene with a U. V. stabilizer, absorbtivity = .95, emissivity = .95

INSULATION

No insulation is used.

CONTAINER

Plastic extrusions at top, bottom and sides.

GASKETS

No gaskets are used.

OPTIONS :

No options.

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670 - 8043

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN — MODEL THEMO-SOLAR PLASTIC

4' X 10' UNGLAZED LIQUID PLASTIC

NSTE TEST REPORT - JUNE 1983

Fr TA = .81 TEST FLOW RATE : .25 kg/sec

Fr U_L = 22.96 TEST FLUID : water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.93	.93

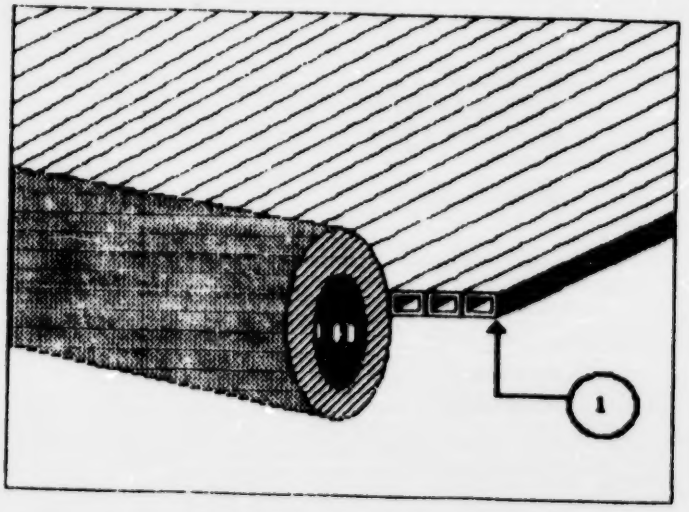
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

3000mm X 1200mm
Gross Area: 3.73 m^2
Net Area: m^2
Weight: kg

MANUFAC. RECOMMENDATIONS

Flow: .2 to .67 l/sec per collector
Pressure: 30 to 120 kPa (140 max)
Max. Oper. Temp. : 60 °C
Heat Transfer Fluid: water, chlorine or salt water



GLAZING

No glazing is used.

ABSORBER (1)

Absorber is extruded black plastic sheet with internal channels which are bonded to headers with a heat seal . Absorber consists of 220 flow channels. Absorber materials are polypropylene and polyethylene with a U. V. stabilizer, absorbtivity = .95, emissivity = .95

INSULATION

No insulation is used.

CONTAINER

No container is used.

GASKETS

No gaskets are used.

OPTIONS :

No options.

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670 - 8043

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLARSYSTEMS

MODEL SOL 100-1,-2,-3

3' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - OCTOBER 1981

Fr TA = .73 TEST FLOW RATE : .0404 kg/sec

Fr U_L = 5.21 TEST FLUID : water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*1.0*	.96	*.98*	.95	*.77*	.55	*.39*

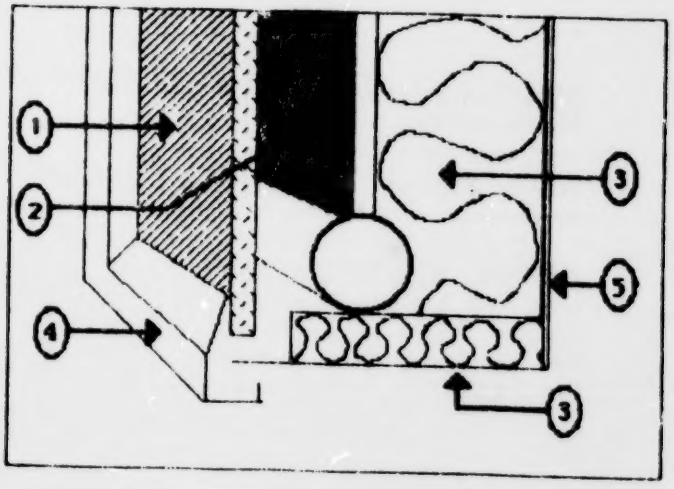
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2466mm X 892mm X 131mm
Gross Area: 2.2 m^2
Net Area: 2.02 m^2
Weight: 48 kg

MANUFAC. RECOMMENDATIONS

Flow: .04 l/sec per collector
Pressure: 670 kPa (1000 max)
Max. Oper. Temp. : 210 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite), thick = 4.0 mm

ABSORBER (2)

8 parallel riser tubes (7.0 mm, type M copper) ultasonically bonded to copper fins (106 mm X .25 mm) and brazed to copper headers Coating is Maxorb Solar Foil (.5 mil thick) with absorbtivity = .95, emissivity = .10

INSULATION (3)

Sides : 12 mm high temp. fiberglass (AW Type 1) (RSI = .34, k = .788 W/m^2C)
Back : 75 mm fiberglass as above, RSI of back = 2.1

CONTAINER

Extruded aluminum frame (4) (alloy 663 T5) and aluminum backing sheet (5) (.51 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber

OPTIONS :

(a) 3' X 6.5' collector

SOLARSYSTEMS INDUSTRIES LTD., 2 - 11771 Horseshoe Way
Richmond, British Columbia, V7A 4S5, (604) 271 - 2621

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLARTECH — MODEL ETC

6' EVACUATED TUBE MODULE

NSTF TEST REPORT - DECEMBER 1981

SEE NOTE BELOW

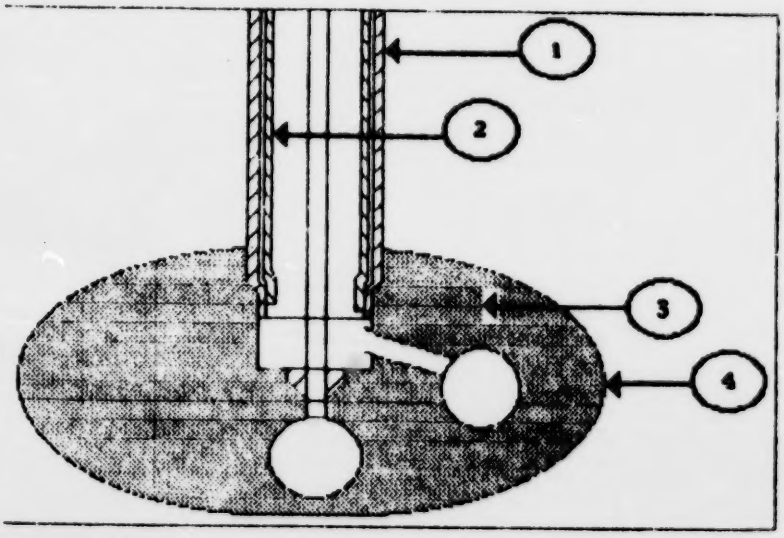
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K										

NOTE: Methods of testing, representing thermal performance and using appropriate computer simulation programs are still being reviewed. Please contact SPO System Engineering Section at 998-3643 for the latest information on these developments.

DIMENSIONS (MODULE)
1985mm X 1219mm X 200mm
Gross Area: 2.42 m^2
Net Area: 2.095 m^2
Weight: 49 kg

MANUFAC. RECOMMENDATIONS
Flow: .01 to .012 l/sec per collector
Pressure: 135 kPa (no maximum indicated)
Max. Oper. Temp.: No Data Available
Heat Transfer Fluid: deionized water



GLAZING (1)

Single glazing of Borosilicate glass, thick = 2.0 mm

ABSORBER (2)

A series of tubes are connected together to form a module. The absorber within each tube is borosilicate glass. The absorber coating is proprietary information but has an absorbtivity = .96, emissivity = .05 Header pipes are 25 mm (supply) and 32 mm (return) type M copper.

INSULATION (3)

The manifold is insulated with 19 mm isocyanurate RSI = .97

CONTAINER (4)

Steel and aluminum support frame, manifold cover is ABS plastic.

GASKETS

Gaskets are high temperature silicone rubber.

OPTIONS:

No options.

SOLARTECH LTD., 700 Gordon Baker Road
Willowdale, Ontario, M2H 3B4, (416) 495 - 1416

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLARTECH — MODEL S37

3' X 7' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - OCTOBER 1982

Fr TA = .73 TEST FLOW RATE : .039 kg/sec

Fr U_L = 3.97 TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	.98	*.96*	.92	*.89*	.87	*.81*	.73	*.58*

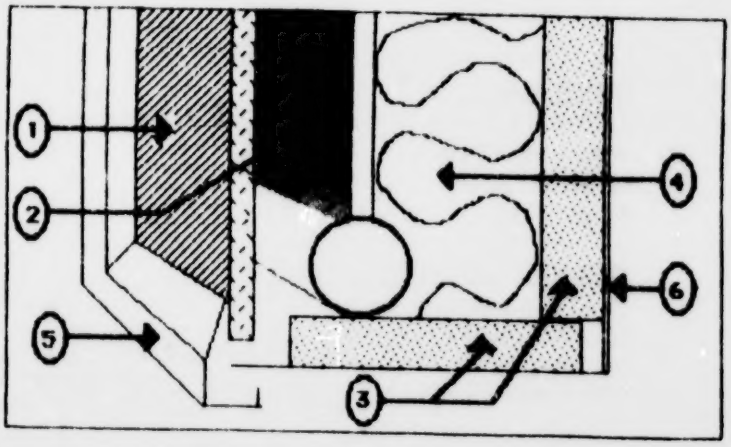
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2137mm X 903mm X 130mm
Gross Area: 1.963 m^2
Net Area: 1.79 m^2
Weight: 52 kg

MANUFAC. RECOMMENDATIONS

Flow: .06 l/sec per collector
Pressure: 552 kPa (862 max)
Max. Oper. Temp. : 240 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite); water white is optional, thick = 4.75 mm

ABSORBER (2)

8 parallel riser tubes (9.5 mm, type L copper) ultasonically bonded to hard copper fins (101 mm X .25 mm) and brazed with silfos welding rods to copper headers (25 mm, type M copper) Coating is Maxorb Solar Foil (.5 mil thick) with absorbtivity = .97, emissivity = .10

INSULATION

Sides : 25 mm rigid, foil-faced, high temp, polyisocyanurate foam (3) (RSI = 1.4, k = .709 W/m^2C)
Back : 25 mm polyisocyanurate foam (3) as above with 38 mm low-binder fiberglass (4) between the absorber and the foam, total RSI of back = 2.68, k of fiberglass = .788 W/m^2C

CONTAINER

Extruded aluminum frame (5) (alloy 6063) and aluminum backing sheet (6) (64 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber

OPTIONS :

(a) S-48 Nom Size 4' X 8' ; Gross Area = 2.97 m^2 (Use above performance parameters)

SOLARTECH LTD., 700 Gordon Baker Road
Willowdale, Ontario, M2H 3B4, (416) 495 - 1416

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLCAN MODEL 2005

3' X 6.5' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - OCTOBER 1981

Fr TA = .67 TEST FLOW RATE : 033 kg/sec

Fr U_L = 5.83 TEST FLUID : glycol/water

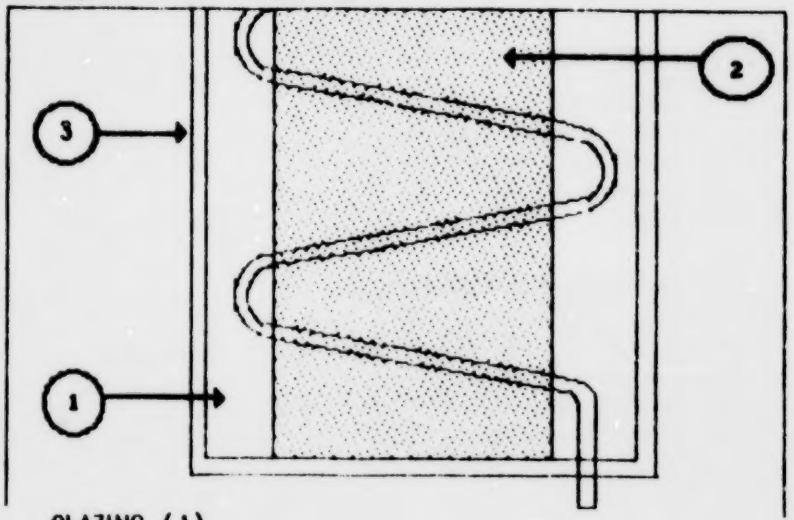
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*.99*	.98	*.98*	.96	*.92*	.82	*.62*

NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS
1960mm X 890mm X 100mm
Gross Area: 1.74 m^2
Net Area: 1.55 m^2
Weight: 40 kg

MANUFAC. RECOMMENDATIONS
Flow: .033 l/sec per collector
Pressure: 200 kPa (680 max)
Max. Oper. Temp. : 95 °C
Heat Transfer Fluid: tap water/glycol



GLAZING (1)

Single glazing of low iron tempered glass (A. F. G. Sunadex); thick = 3.0 mm

ABSORBER (2)

The absorber consists of a grooved aluminum sheet (utility grade, .813mm thick) with a continuous serpentine copper tube (12.7mm type L copper) bonded to the grooves with heat transfer cement Coating is a flat black enamel (Korzite Solar Black Paint) with absorbtivity = .92, emissivity = .83

INSULATION

Sides : 19 mm rigid, foil-faced, high temp. polyisocyanurate foam (RSI = 0.7, k = .709 W/m^2C)
Back : 28 mm polyisocyanurate foam as above, RSI of back = 2.1

CONTAINER (3)

Fabricated from brake-formed aluminum sheet pre-coated with high gloss polyester paint

GASKETS

Geon Vinyl used as gasket between glass and glazing frame; EPDP (Ethylene Propylene Diene Polymer) used as gasket gasket between glazing assembly and collector box

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OPTIONS :

No options

SOLCAN LTD., RR #3
London, Ontario, N6A 4B7, (519) 473 0501

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLCAN — MODEL 3001L

3' X 8' GLAZED LIQUID FINNED TUBE

NSTE TEST REPORT - DECEMBER 1981

Fr TA = .78 TEST FLOW RATE : .035 kg/sec

Fr U_L = 7.00 TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	.99	.98	*.98*	.98	*.98*	.98	*.93*	.82	*.56*

NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45^0)

DIMENSIONS

2470mm X 895mm X 100mm

Gross Area: 2.2 m^2

Net Area: 1.94 m^2

Weight: 50 kg

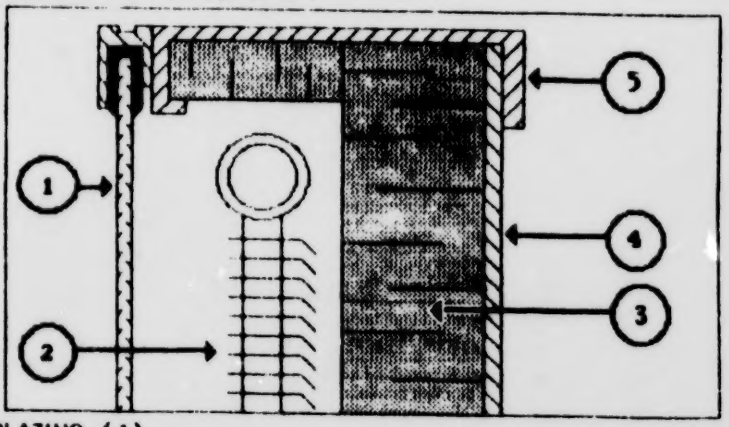
MANUFAC. RECOMMENDATIONS

Flow: .035 l/sec per collector

Pressure: 345 kPa (515 max)

Max. Oper. Temp. : 110 ^{0}C

Heat Transfer Fluid: Dowfrost NT
(inhibited propylene glycol)



GLAZING (1)

Single glazing of low iron tempered glass (A. F. G. Sunadex); thick = 3.0 mm

ABSORBER (2)

The absorber consists of a number of light weight aluminum fins with copper tubes (12mm, type L copper) running vertically through the fins with a friction fit. The riser tubes are brazed with silfos silver solder to copper headers (32 mm, type M copper) Coating is Korzite Solar with absorbtivity = .935, emissivity = .808

INSULATION (3)

Sides : 25 mm rigid, foil-faced, high temp, polyisocyanurate foam (RSI = 1.4, k = .709 W/m^2C)

Back : 38 mm polyisocyanurate foam as above, RSI of back = 2.1

CONTAINER (4) & (5)

Fabricated from brake-formed aluminum sheet pre-coated with high gloss polyester paint and riveted together.

GASKETS

Geon Vinyl used as gasket between glass and glazing frame; EPDP (Ethylene Propylene Diene Polymer) used as gasket gasket between glazing assembly and collector box; silicone is used to seal the edges of the insulation during assembly.

OPTIONS :

(a) 3001S ; 3' X 6.5'; Area = 1.75 m^2 (use above performance parameters)

SOLCAN LTD., RR #3

London, Ontario, N6A 4B7, (519) 473 - 0501

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOL - PRO

MODEL E - 100

6' EVACUATED TUBE MODULE

NSTE TEST REPORT - OCTOBER 1981

SEE NOTE BELOW

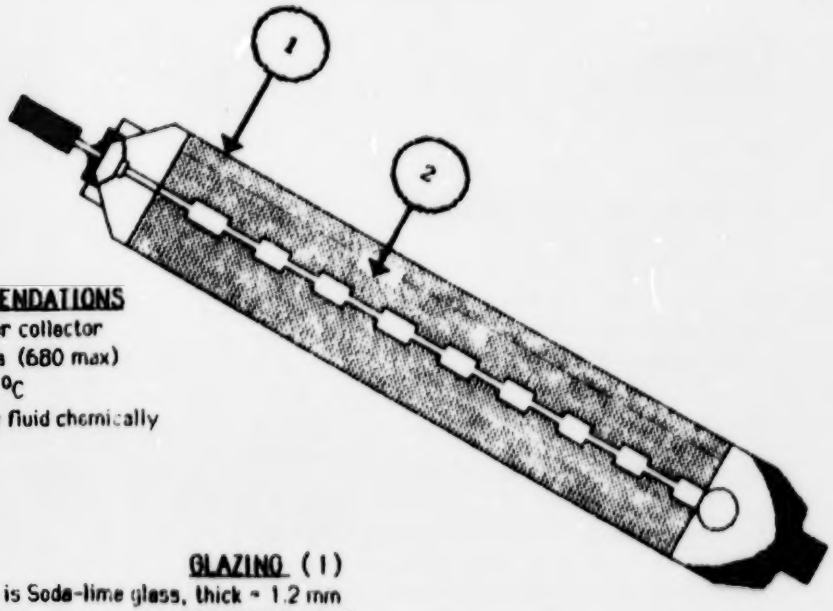
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K										

NOTE : Methods of testing, representing thermal performance and using appropriate computer simulation programs are still being reviewed. Please contact SPO System Engineering Section at 998-3643 for the latest information on these developments.

DIMENSIONS

NOT AVALILABLE.



MANUFAC. RECOMMENDATIONS

Flow: .07 to .7 l/sec per collector
Pressure: 80 to 300 kPa (680 max)
Max. Oper. Temp. : 175 °C
Heat Transfer Fluid: any fluid chemically compatible with copper

GLAZING (1)

Evacuated tube envelope is Soda-lime glass, thick = 1.2 mm

ABSORBER (2)

Several tubes are connected to a single heat exchanger/header combination. Header is 25 mm, type M copper. Tube absorber is a copper plated steel heat pipe coated with cobalt oxide with absorbtivity = .92, emissivity = .06

INSULATION

Header manifold only is insulated with 50 mm of batt-type insulation, RSI = 1.3

CONTAINER

Aluminum frame (alloy 6063) and aluminum backing sheet

GASKETS

Grommets are silicone rubber

OPTIONS :

No options.

LES INDUSTRIES HENRI MITCHELL LTEE., 5368 - 13e Ave., Rosemont
Montreal, Quebec, H1X 2X8, (514) 725 - 9564

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLTRAC

MODEL 2.5 SS

3' X 8' GLAZED REFRIGERANT FLAT PLATE
FOR REFRIGERANT USE ONLY

INRS TEST REPORT - FEBRUARY 1984

Fr TA = .73 TEST FLOW RATE : .06 kg/sec
Fr U_L = 5.04 TEST FLUID : glycol/water

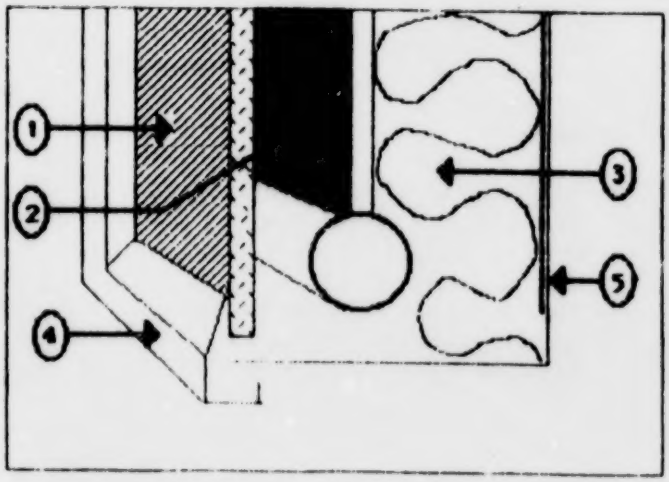
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K										

NOTE : For information or simulation procedures contact SPO System Engineering Section at 998-3643

DIMENSIONS
2616mm X 1010mm X 84mm
Gross Area: 2.64 m^2
Net Area: 2.47 m^2
Weight: 47 kg

MANUFAC. RECOMMENDATIONS
Flow: NA
Pressure: - 27 to 300 kPa (300 max)
Max. Oper. Temp. : 214 °C
Heat Transfer Fluid: Refigerant 113
(Freon 113 or Freon TF)



GLAZING (1)
Single glazing of low iron tempered glass (Armourfloat); thick = 4.0 mm

ABSORBER (2)
Absorber is aluminum roll bond refrigerant absorber. Coating is anodized selective surface with absorbtivity = .92, emissivity = .17.

INSULATION
Sides : No side insulation is used.
Back : 51 mm high temperature fiberglass (AW Type I) RSI of back = 0.7 (3)

CONTAINER
Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5)

GASKETS
EPDM gaskets.

OPTIONS :
No options.

SOLTRAC INC., 2270, 46e Ave.
Lachine, Quebec, H8T 2P3, (514) 631 - 9860

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOL-WAY — MODEL SAS

4' X 8' GLAZED LIQUID FLAT PLATE — FLUSH MOUNT ONLY

NSTE TEST REPORT - APRIL 1983

Fr TA = .65 TEST FLOW RATE : 10 kg/sec

Fr U_L = 4.79 TEST FLUID : water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	.99	*.98*	.98	*.97*	.95	*.91*	.85	*.66*

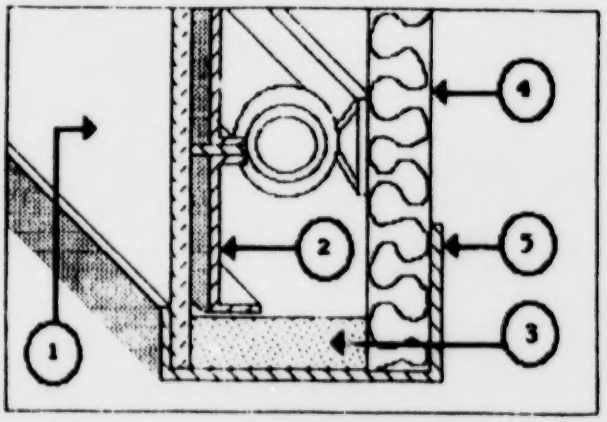
NOTE: Use values in italics for simulation programs limited to 5 value inputs (Some programs may use all values except at 45°)

DIMENSIONS

2440mm X 1220mm X 76mm
Gross Area: 3.0 m^2
Net Area: 2.81 m^2
Weight: 47 kg

MANUFAC. RECOMMENDATIONS

Flow: .025 to .15 l/sec per collector
Pressure: 550 kPa (690 max)
Max. Oper. Temp. : 120 °C
Heat Transfer Fluid: any fluid chemically compatible with copper, inhibitors may be required depending on water analysis



GLAZING (1)

Single glazing of standard outdoor acrylic (Lucite), thick = 3.0 mm

ABSORBER (2)

6 parallel riser tubes (16mm, type L copper) clipped with cadmium plated spring steel clips to aluminum sheet fins (utility grade aluminum, .64mm thick) and brazed to copper headers (type L copper) Coating is flat black heat resistant paint with absorbtivity = .90, emissivity = .90

INSULATION

Sides : 20 mm rigid, high temp, polyisocyanurate foam (3) (RSI = 1.24, k = .709 W/m^2C)
Back : 25 mm rigid board fiberglass, organic resin binder, kraft paper, aluminized mylar (RSI = .71) (4)

CONTAINER

.025 mm prefinished galvanized steel with dark brown enamel finish (5)

GASKETS

No sealants or gaskets are used. The sprung outer frame provides non-capillary active sealing.

OPTIONS :

(a) black chrome on a copper absorber; absorbtivity = .93, emissivity = .06

SOL-WAY ENERGY CORP., 942 S. W. Marine Dr., Suite 30
Vancouver, British Columbia, V6P 5Z2, (604) 324 - 3327

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SUNGLO

MODEL 1 - 40 A

4' X 10' UNGLAZED LIQUID PLASTIC

NSTE TEST REPORT - DECEMBER 1982

Fr TA = .76 TEST FLOW RATE : .315 kg/sec

Fr U_L = 21.08 TEST FLUID : glycol/water

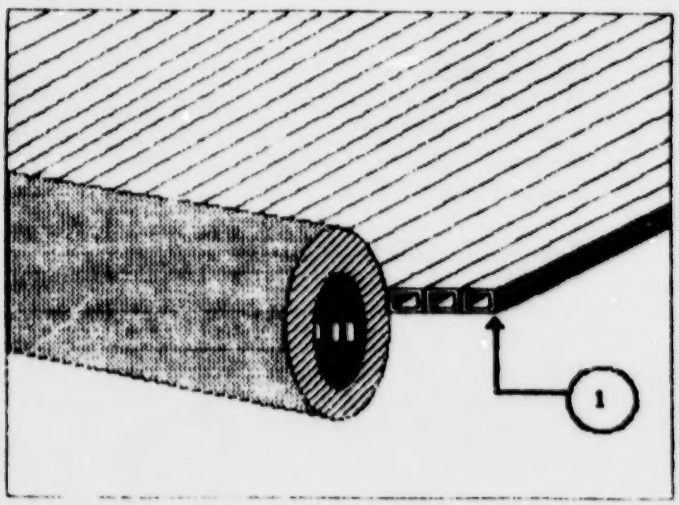
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	1.0	1.0	1.0	.97	.92	.82	.63

NOTE : Use values in Italics for simulation programs limited to 5 value inputs
(Some programs may use all values except at 45°)

DIMENSIONS
2921mm X 1219mm
Gross Area: 3.68 m^2
Net Area: m^2
Weight: 6.8 kg

MANUFAC. RECOMMENDATIONS
Flow: .21 to .6 l/sec per collector
Pressure: 103 kPa (138 max)
Max. Oper. Temp.: 55 °C
Heat Transfer Fluid: any conventional heat transfer fluid



GLAZING

No glazing is used.

ABSORBER (1)

Absorber is extruded profile plastic sheet with internal channels which are bonded to headers. Absorber consists of 210 flow channels. Absorber materials are polypropylene, polyethylene and carbon black with U.V. stabilizers, absorbtivity = NA, emissivity = NA

INSULATION

No insulation is used.

CONTAINER

No container is used.

GASKETS

No gaskets are used.

OPTIONS :

(a) 4' x 8' collector, area = 2.97 m^2
(b) custom lengths up to 20 feet

SUNGLO SOLAR LTD., 35 Citron Court
Concord, Ontario, L4K 2S7, (416) 738 - 0300

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SUN RAY — MODEL 37 SERIES

3' X 7' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - MARCH 1982

Fr TA = .66 — TEST FLOW RATE : .035 kg/sec

Fr U_L = 4.67 — TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*1.0*	1.0	*1.02*	.98	*.96*	.83	*.57*

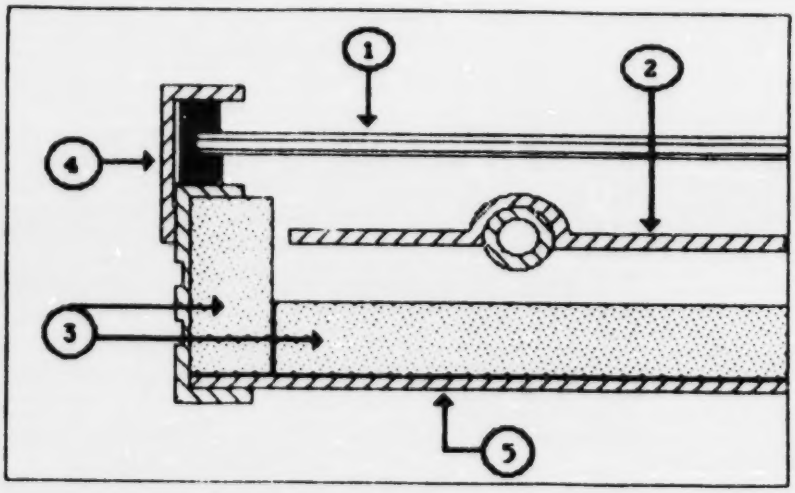
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2151mm X 883mm X 81.7mm
Gross Area: 1.899 m^2
Net Area: 1.748 m^2
Weight: 41 kg

MANUFAC. RECOMMENDATIONS

Flow: .03 to .06 l/sec per collector
Pressure: 552 kPa (861 max)
Max. Oper. Temp.: 125 °C
Heat Transfer Fluid: inhibited aqueous solutions; inhibited ethylene and propylene glycols; potable water



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite); float glass is optional, thick = 4.75 mm

ABSORBER (2)

7 parallel riser tubes (type M copper) continuously soldered to a die-formed copper sheet (copper alloy, .254mm thick) and brazed to copper headers (type L copper) Coating is Black Chrome with absorbtivity = .95, emissivity = .11

INSULATION (3)

Sides : 25 mm rigid, foil-faced, high temp. polyisocyanurate foam (RSI = 1.4, k = .709 W/m^2C)
Back : 25 mm polyisocyanurate foam as above RSI of back = 1.4

CONTAINER

Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5) (.51 mm thick)

GASKETS

EPDM gaskets

OPTIONS :

No options.

SUN RAY SOLAR SYSTEMS LTD., 2429 Seminole Street
Windsor, Ontario, N8Y 1X2, (519) 253 - 1182

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SUN RAY — MODEL 48 SERIES

4' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - MAY 1982

Fr TA = .69 TEST FLOW RATE : .057 kg/sec

Fr U_L = 4.33 TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*.99*	.98	*.96*	.94	*.88*	.77	*.57*

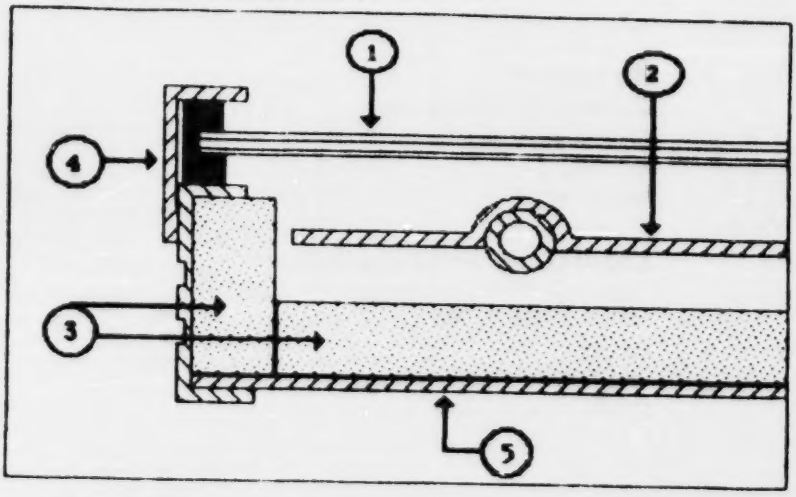
NOTE : Use values in italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45^0)

DIMENSIONS

2459mm X 1191mm X 113mm
Gross Area: 2.93 m^2
Net Area: 2.64 m^2
Weight: 66 kg

MANUFAC. RECOMMENDATIONS

Flow: .047 to .063 l/sec per collector
Pressure: 550 kPa (660 max)
Max. Oper. Temp. : 125 ^{0}C
Heat Transfer Fluid: inhibited aqueous solutions; inhibited ethylene and propylene glycols; potable water



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite); float glass is optional, thick = 5.0 mm

ABSORBER (2)

9 parallel riser tubes (type M copper) continuously soldered to a die-formed copper sheet (copper alloy, .254mm thick) and brazed to copper headers (type L copper) Coating is Black Chrome with absorbtivity = .95, emissivity = .10

INSULATION (3)

Sides : 25 mm rigid, foil-faced, high temp. polyisocyanurate foam (RSI = 1.4, k = .709 W/m^2C)
Back : 25 mm polyisocyanurate foam as above RSI of back = 1.4

CONTAINER

Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5) (.51 mm thick)

GASKETS

EPDM gaskets

OPTIONS :

No options.

SUN RAY SOLAR SYSTEMS LTD., 2429 Seminole Street
Windsor, Ontario, N8Y 1X2, (519) 253 - 1182

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

THERMO DYNAMICS — MODEL A22R6H1F3

3' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - FEBRUARY 1983

Fr TA = .74 TEST FLOW RATE : .180 kg/sec

Fr U_L = 6.23 TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.01	*1.01*	.98	*.96*	.93	*.84*	.69	*.51*

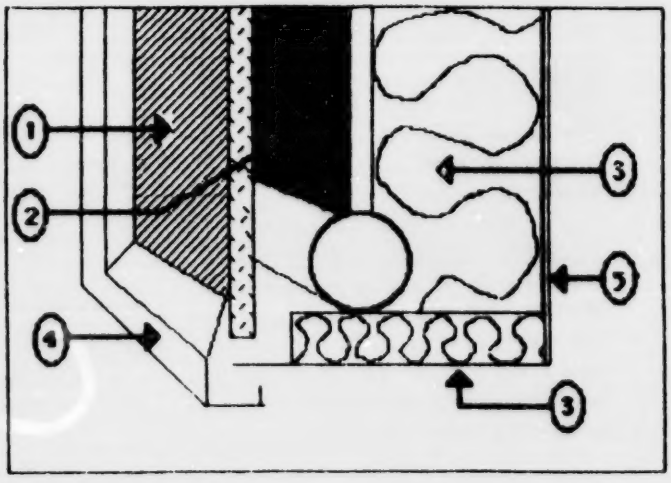
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2508mm X 924mm X 83mm
Gross Area: 2.34 m^2
Net Area: 2.13 m^2
Weight: 43.5 kg

MANUFAC. RECOMMENDATIONS

Flow: .167 l/sec per collector
Pressure: 150 to 700 kPa (700 max)
Max. Oper. Temp. : 150 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite or AFG Solatex), thick = 3.2 mm

ABSORBER (2)

6 parallel riser tubes (16 mm, type L copper) solder bonded (50/50 tin/lead) to hard copper fins (146 mm X .53 mm) and brazed with silfos welding rods to copper headers (28 mm, type M copper) Coating is selective black paint with absorbtivity = .95, emissivity = .50

INSULATION (3)

Sides : 25 mm rigid, fiberglass (RSI = .71, k = .788 W/m^2C)
Back : 38 mm fiberglass as above RSI of back = 1.06, k of fiberglass = .788 W/m^2C

CONTAINER

Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5) (.41 mm thick)

GASKETS

EPDM gaskets, grommets are neoprene rubber

OPTIONS :

(a) A22R6SS; uses Sun Strip absorber; use above parameters.

THERMO DYNAMICS INC., 24 Simmonds Dr., Burnside
Dartmouth, Nova Scotia, B3B 1R3, (902) 469 - 1101

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

THERMO DYNAMICS — MODEL A22R5H1F2

3' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - FEBRUARY 1983

Fr TA = .70 TEST FLOW RATE : .160 kg/sec

Fr U_L = 5.85 TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	.99	*.98*	.97	*.95*	.93	*.88*	*.78*	*.59*

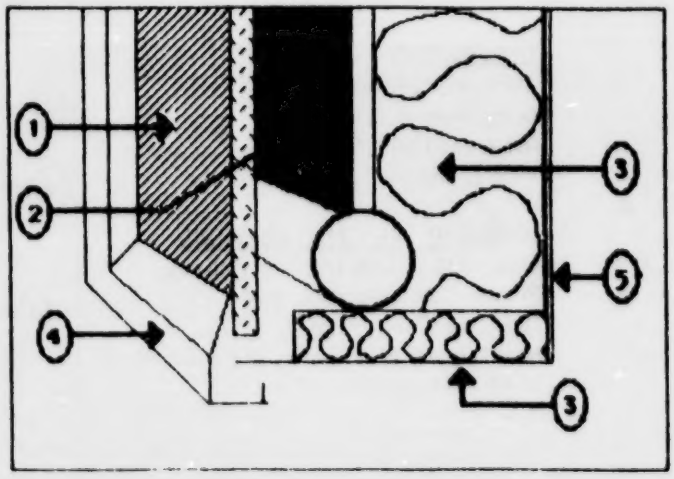
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2508mm X 924mm X 83mm
Gross Area: 2.34 m^2
Net Area: 2.13 m^2
Weight: 43.5 kg

MANUFAC. RECOMMENDATIONS

Flow: .167 l/sec per collector
Pressure: 150 to 700 kPa (700 max)
Max. Oper. Temp. : 150 °C
Heat Transfer Fluid: any fluid chemically compatible with copper



GLAZING (1)

Single glazing of low iron tempered glass (Heliolite or AFG Solatex), thick = 3.2 mm

ABSORBER (2)

5 parallel riser tubes (16 mm, type L copper) solder bonded (50/50 tin/lead) to hard copper fins (175 mm X .53 mm) and brazed with silfos welding rods to copper headers (28 mm, type M copper) Coating is selective black paint with absorbtivity = .95, emissivity = .50

INSULATION (3)

Sides : 25 mm rigid, fiberglass (RSI = .71, k = .788 W/m^2C)
Back : 25 mm fiberglass as above RSI of back = 1.06, k of fiberglass = .788 W/m^2C

CONTAINER

Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5) (.41 mm thick)

GASKETS

EPDM gaskets, grommets are neoprene rubber

OPTIONS :

No options.

THERMO DYNAMICS INC., 24 Simmonds Dr., Burnside
Dartmouth, Nova Scotia, B3B 1R3, (902) 469 - 1101

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

WATERSHED MODEL L-100A

3' X 6.5' GLAZED LIQUID FLAT PLATE

NSTF TEST REPORT - SEPTEMBER 1981

Fr TA = .69 TEST FLOW RATE : .033 kg/sec

Fr U_L = 4.80 TEST FLUID : glycol/water

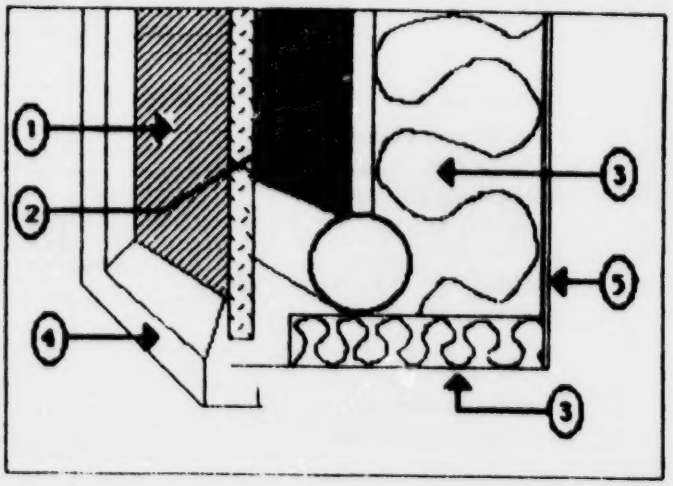
INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	.99	*.99*	.99	*.98*	.95	*.84*	.61	*.42*

NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS
1960mm X 892mm X 127mm
Gross Area: 1.75 m^2
Net Area: 1.59 m^2
Weight: 35 kg

MANUFAC. RECOMMENDATIONS
Flow: .035 to .055 l/sec per collector
Pressure: 200 kPa (500 max)
Max. Oper. Temp. : 180 °C
Heat Transfer Fluid: water, or a mixture of inhibited glycols



GLAZING (1)

Single glazing of low iron tempered glass (AS6 Solatex); thick = 3.0 mm

ABSORBER (2)

5 parallel riser tubes (9.5 mm, type L copper) mechanically bonded to roll formed aluminum fins (3003 H14 aluminum, .813 mm thick) and coated with a thermal conducting compound and connected to copper headers (41 mm, type M copper) Coating is Maxorb Solar Foil (.5 mil thick) with absorbtivity = .97, emissivity = .10

INSULATION (3)

Sides : 13 mm low binder, high temperature resistant fiberglass (RSI = .35, k = .788 W/m^2C)
Back : 51 mm low binder, high temperature resistant fiberglass (RSI = 1.5, k = .788 W/m^2C)

CONTAINER

Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5) (.51 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber

OPTIONS :

No options.

WATERSHED ENERGY SYSTEMS, 97 Six Point Road
Etobicoke, Ontario, M8Z 2X3, (416) 233 - 3241

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

WATERSHED — MODEL L-200

4' X 8' GLAZED LIQUID FLAT PLATE

NSTE TEST REPORT - JUNE 1983

Fr TA = .67 — TEST FLOW RATE : .056 kg/sec

Fr U_L = 4.90 — TEST FLUID : glycol/water

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*1.0*	.98	*.96*	.93	*.83*	.65	*.43*

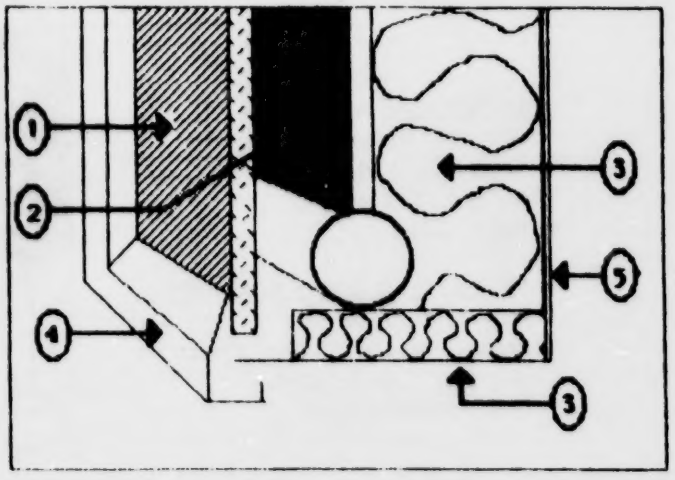
NOTE : Use values in Italics for simulation programs limited to 5 value inputs.
(Some programs may use all values except at 45°)

DIMENSIONS

2470mm X 1201mm X 127mm
Gross Area: 2.97 m^2
Net Area: 2.85 m^2
Weight: 56 kg

MANUFAC. RECOMMENDATIONS

Flow: .035 to .055 l/sec per collector
Pressure: 200 kPa (500 max)
Max. Oper. Temp. : 180 °C
Heat Transfer Fluid: water, or a mixture of inhibited glycols



GLAZING (1)

Single glazing of low iron tempered glass (ASG Solatex); thick = 5.0 mm

ABSORBER (2)

5 parallel riser tubes (9.5 mm, type L copper) mechanically bonded to roll formed aluminum fins (3003 H14 aluminum, .813 mm thick) and coated with a thermal conducting compound and connected to copper headers (41 mm, type M copper) Coating is selective black paint with absorbtivity = .90, emissivity = .15

INSULATION (3)

Sides : 13 mm low binder, high temperature resistant fiberglass (RSI = .35, k = .788 W/m^2C)
Back : 51 mm low binder, high temperature resistant fiberglass (RSI = 1.5, k = .788 W/m^2C)

CONTAINER

Extruded aluminum frame (4) (alloy 6063) and aluminum backing sheet (5) (.51 mm thick)

GASKETS

EPDM gaskets, grommets are silicone rubber

OPTIONS :

No options.

WATERSHED ENERGY SYSTEMS, 97 Six Point Road
Etobicoke, Ontario, M8Z 2X3, (416) 233 - 3241

SPO APPROVED SOLAR COLLECTOR

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

WATERSHED — **MODEL A - 100**

3' X 6.5' GLAZED AIR FLAT PLATE — **FLUSH MOUNT ONLY**

NSTF TEST REPORT - NOVEMBER 1982

Fr TA = .64 TEST FLOW RATE : .095 kg/sec

Fr U_L = 4.81 TEST FLUID : air

INCIDENT ANGLE MODIFIER

ANGLE	0	10	20	30	40	45	50	60	70	80
K	*1.0*	1.0	1.0	*1.0*	1.0	*1.0*	.99	*.93*	.77	*.53*

NOTE (Use values in italics for simulation programs limited to 5 value inputs. (Some programs may use all values except at 45°)

DIMENSIONS

2004mm X 924mm X 143mm

Gross Area: 1.89 m^2

Net Area: 1.61 m^2

Weight: 30 kg

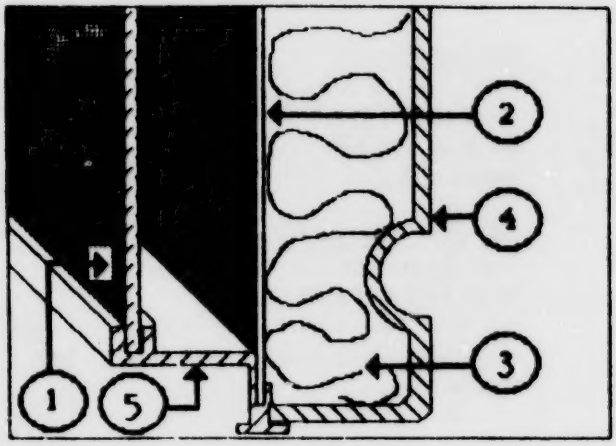
MANUFAC. RECOMMENDATIONS

Flow: 11 l/sec per m^2

Pressure: less than .5 kPa (.5 max)

Max. Oper. Temp. : 180 °C

Heat Transfer Fluid: air



GLAZING (1)

Single glazing of low iron tempered glass (Solatex), thickness = 3.0 mm.

ABSORBER (2)

Sheet steel (.45 mm thick) coated with black chrome, absorbtivity = .93, emissivity = .10

INSULATION (3)

Sides : None - 25 mm of fiberglass is sandwiched between the collector rows during installation.

Back : 90 mm low binder fiberglass.

CONTAINER

Galvanized steel (.46 mm thick) air channel backing (4), air channel backing frame is aluminum extrusion (6063 alloy). (5)

GASKETS

Silicone gaskets are used.

OPTIONS :

No options.

WATERSHED ENERGY SYSTEMS, 97 Six Point Road
Etobicoke, Ontario, M8Z 2X3, (416) 233 - 3241

SECTION 2
APPROVED PACKAGED
SOLAR SYSTEMS

1 November 1984

(supersedes: 1 June 1984)

The attached lists of SPO Approved Packaged Solar Systems and options include the most recent available data.

Details of systems and schematics appear on a separate sheet for every system.

Information:

Product Engineering Section
Solar Programs Office
Public Works Canada
Confederation Heights
Ottawa K1A 0M2

R. Saunders (613) 998-3940
L. Emerton (613) 998-3643

INDEX:

Effective Date: **1 November 1984** (supercedes: 1 June 1984)

	System	Type
1.	LamCo	REF
2.	LPC	AIR
3.	Norsun	CL
4.	Norsun	DB
5.	Norsun	D
6.	Petro-Sun DB	DB
7.	Petro-Sun DBII	DB
8.	Petro-Sun	TS
9.	Solarsystems	DB
10.	Solartech DB-1	DB
11.	Solartech DBS-1	DB
12.	Solcan	CL
13.	Solcan	TS
14.	Solcan	DD
15.	Sol-Pro (Mitchell)	CL
16.	Soltrac	REF
17.	Solway TTDB	DB
18.	Solway TH	TS
19.	Sun Ray	CL
20.	Sun Ray	DB
21.	Sun Ray	TS
22.	Thermo Dynamics	CL

LEGEND:

Type:

AIR Air Heating
CL Closed Loop
DB Drain Back
D Direct Circulation, Preheat
DD Drain Down
REF Refrigerant Filled
TS Thermosyphon

Components

- Pump
- Controller
- Elapsed Time Meter
- Peterson Plug
- Expansion Tank
- Pressure Gauge
- Thermostat
- Flow Indicator
- Sight Glass
- Manual Air Vent
- Vacuum Breaker

Valves

- T.P. Relief
- Tempering
- Drain
- Isolation
- Control
- Check
- Solenoid
- Drain Down
- Thermal Expansion

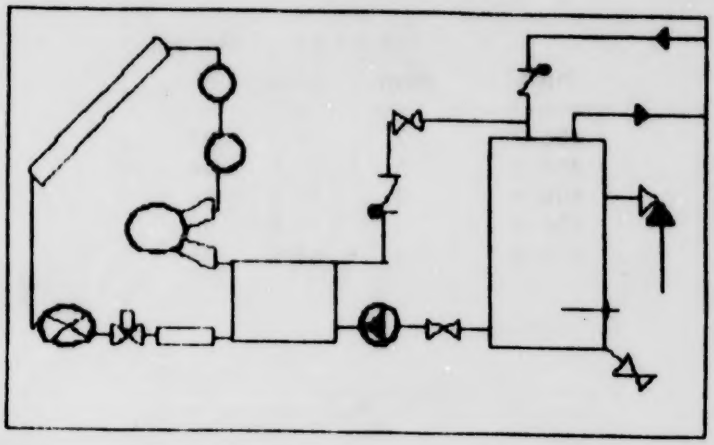
SPG APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

LAMCO REFRIGERENT FILLED

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Collectors Area	Storage Litres
L075-01-0104	4	8.4	273



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two Lamco F.S. 7092 (2.1 m^2) aluminum, non-glazed refigerent flat plate collectors.

STORAGE TANK

The storage tank is not included in the basic package. The existing DHW is to be used or the storage tank will be installed separately if required.

HEAT EXCHANGER

The refigerant condenser, co-axial helix, packless, serves as an external heat exchanger. Tubing is copper/nickel.

PUMP

A Mysen LA 43, screwed flange pump is used in the DHW loop.

CONTROLLER

A differential controller manufactured by Lamco is used.

OTHER COMPONENTS

Aquastat: Honeywell L6008A-1010; refigerent valves: Alco TX Model 1 RCDE $1^1/_2$ FW; solenoid 24V; a check valve is also included with the system.

ADDITIONAL NOTES

Pressure/temperature relief valve is supplied by the installer. Overheat protection is provided by a Honeywell Hi/Low limit pressure switch to stop the refrigeration cycle.

INTERNATIONAL PLASTICS LTD. (LAMCO DIVISION), 12180 Vickers Way
Richmond, British Columbia, V6V 1H9, (604) 253-4351

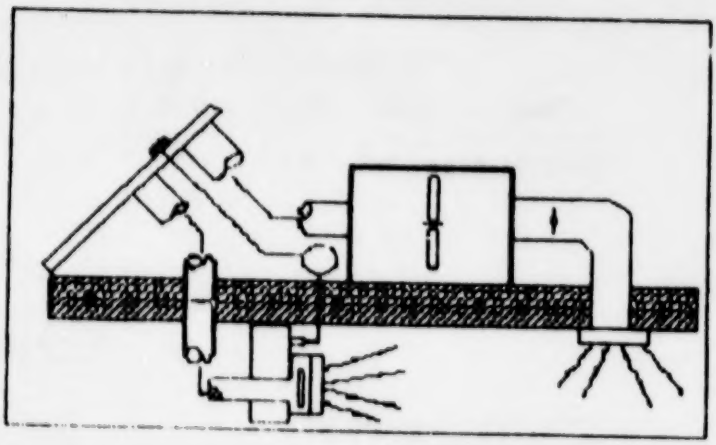
SRC APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

LPC AIR HEATING

STATUS: *PROTOTYPE*

Model	Collectors Quant	Collectors Area	Storage Litres
406-2	2	7.7	NA
406-3	3	11.5	NA
406-4	4	15.3	NA
406-6	6	23.0	NA
406-8	8	30.6	NA



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to eight LPC Model 406 (3.83 m^2) glazed flat plate air collectors.

STORAGE TANK

No storage tank is required.

HEAT EXCHANGER

No heat exchanger is required.

BLOWER

A Dayton centrifugal wheel blower with shaded pole motor with automatic thermal protection is used.

CONTROLLER

Therm-O-Disc thermostat is installed on the collector.

OTHER COMPONENTS

Return air damper is supplied by the installer.

ADDITIONAL NOTES

None.

LPC CANADA LTD., P. O. Box 90
Sprague, Manitoba, R0A 1Z2, (204) 437-2123

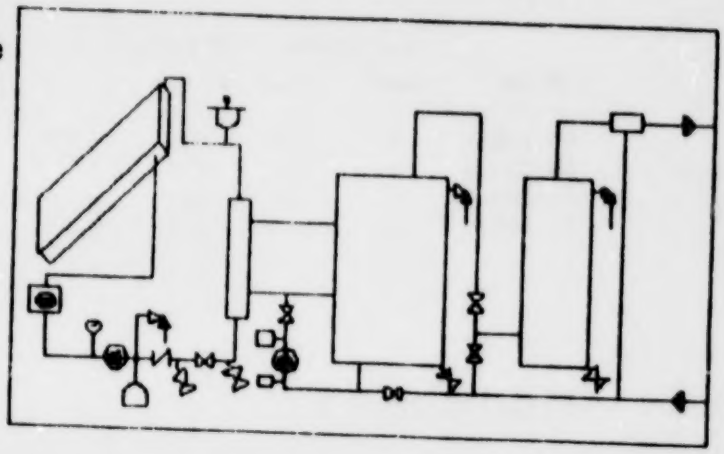
SPG APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

NORSUN CLOSED LOOP

STATUS: *PROVISIONAL*

Model	Collectors Quant	Collectors Area	Storage Litres
CL-150-2	2	4.5	180
CL-150-3	3	6.7	180
CL-150-2	2	4.5	272
CL-150-3	3	6.7	272
CL-150-4	4	8.9	272
CL-150-5	5	11.2	272



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to five Norsun TD-2000 (2.23 m^2) collectors piped in series. Single headers are hard coupled with 95-5 solder.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a glass lined, 205 litre Rudd 40 or 270 litre Rudd 60 with a magnesium anode rod to prevent corrosion. The tank is insulated with 50 mm of fibreglass between the outer case and the steel tank. The maximum tank temperature is 105°C ; maximum operating pressure is 862 kPa.

HEAT EXCHANGER

A single wall tube-in-tube heat exchanger is pre-plumbed in the Unipak. The heat exchanger is manufactured by Norsun from 3/4" type L copper tubing for the potable water and 3/8" type L copper for the solar loop. Maximum operating pressure is 344 kPa.

PUMP

Two pumps are used. A Grundfos 20 - 42 pump is used in the collector loop and a Hartel CP-108-1D pump is used on the potable water side. Maximum operating temperature is 130 °C ; maximum operating pressure is 977 kPa for the solar loop.

CONTROLLER

An Independent Energy C-30 controller is used to measure the temperature difference between the absorber plate and the storage tank. Temperature differentials are factory set at 4 °C on and 2 °C off. Temperature sensors are thermister type.

OTHER COMPONENTS

None noted.

ADDITIONAL NOTES

Temperature and pressure gauges are included.

NORSUN, P. O. Box 288
Manotick, Ontario, K0A 2N0, (613) 692-2513

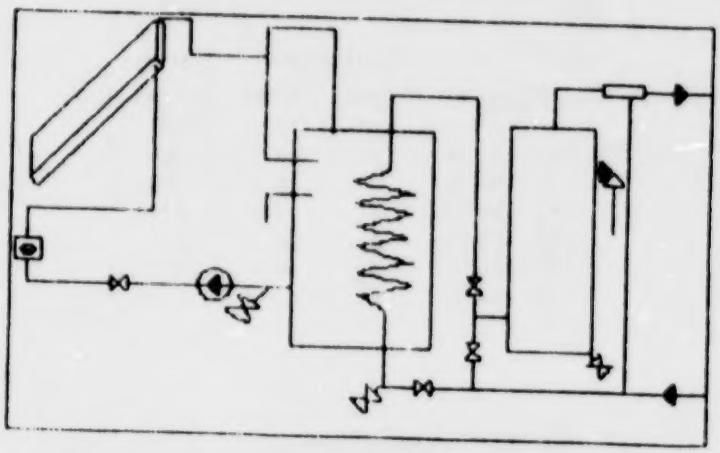
SRC APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

NORSUN DRAIN BACK

STATUS: *PROVISIONAL*

Model	Collectors Quant	Collectors Area	Storage Litres
DB-225-2	2	4.5	454
DB-300-3	3	6.7	454
DB-300-4	4	8.9	454
DB-300-5	5	11.2	454



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to five Norsun TD 2000 (2.23 m^2) collectors piped in series. Single headers are hard coupled with 95-5 solder.

STORAGE TANK (SOLAR PREHEAT/DRAINBACK TANK)

A polyethylene atmospheric tank, 454 litres by Rosedale Plastics used with a demand type heat exchanger in series with the existing DHW heater. The tank is insulated with 50 mm of fibreglass with a vinyl jacketing. The maximum tank temperature is 100°C intermittent.

HEAT EXCHANGER

An internal demand type heat exchanger coiled inside the storage tank. This heat exchanger consists of a 50m copper coil of 16mm tubing as manufactured by Norsun. Design flow rate of collector fluid is 4-6 l/min ; maximum operating pressure is 860 kPa.

PUMP

A Hartel GPPS-45H-1 pump is used in the collector loop. Maximum operating temperature is 100 °C ; maximum operating pressure is 1054 kPa.

CONTROLLER

An independent Energy C-30 controller is used to measure the temperature difference between the absorber plate and the storage tank. Temperature differentials are factory set at 11 °C on and 1°C off. Temperature sensors are thermister type.

OTHER COMPONENTS

The system also consists of: isolation valves, a balancing valve, fill/drain valve, combination sightglass and flowmeter. Tempering valve is optional.

ADDITIONAL NOTES

Over temperature protection factory set at 60 °C in the controller.

NORSUN, P. O Box 288
Manotick, Ontario, K0A 2N0, (613) 692-2513

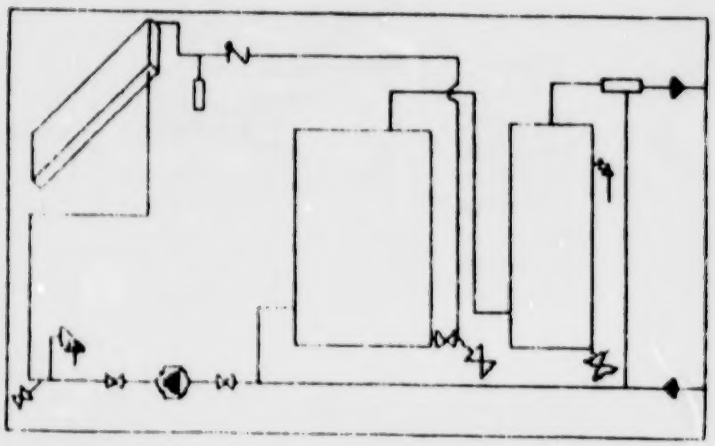
SPG APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

NORSUN EQUINOX + SOLAR PRE-HEAT

STATUS: *PROTOTYPE*

Model	Collectors Quant	Collectors Area	Storage Litres
EQ+1 (SPH)	1	2.2	180
EQ+2 (SPH)	2	4.5	180
EQ+3 (SPH)	3	6.7	180
EQ+1 (SPH)	1	2.2	270
EQ+2 (SPH)	2	4.5	270
EQ+3 (SPH)	3	6.7	270
EQ+4 (SPH)	4	8.9	270



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of one to five Norsun TD-2000 (2.23 m^2) collectors piped in series. Single headers are hard coupled with 95-5 solder.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a glass lined, 205 litre Rudd 40 or 270 litre Rudd 60 with a magnesium anode rod to prevent corrosion. The tank is insulated with 50 mm of fibreglass between the outer case and the steel tank. The maximum tank temperature is 105°C ; maximum operating pressure is 862 kPa.

HEAT EXCHANGER

No heat exchanger is used, system operates with potable water circulated directly through the collectors.

PUMP

A Grundfos 25-42 pump is used in the collector loop. Maximum operating temperature is 110 °C ; maximum operating pressure is 998 kPa.

CONTROLLER

An independent Energy C-30 controller is used to measure the temperature difference between the absorber plate and the tank. Temperature differentials are factory set at 4 °C on and 2°C off. Temperature sensors are thermister type.

OTHER COMPONENTS

Tempering valve is used for over heat protection. Frost valve is used for freeze protection.

ADDITIONAL NOTES

None.

NORSUN, P. O. Box 288
Manotick, Ontario, K0A 2N0, (613) 692-2513

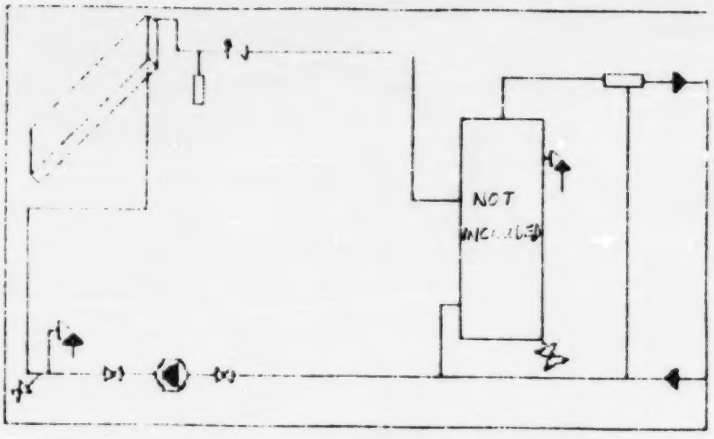
SPG APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

NORSUN EQUINOX + SOLAR ONLY

STATUS: *PROTOTYPE*

Model	Collectors Quant	Area	Storage Litres
EQ+1 (SO)	1	2.2	180
EQ+2 (SO)	2	4.5	180
EQ+3 (SO)	3	6.7	180
EQ+1 (SO)	1	2.2	270
EQ+2 (SO)	2	4.5	270
EQ+3 (SO)	3	6.7	270
EQ+4 (SO)	4	8.9	270



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of one to five Norsun TD-2000 (2.23 m^2) collectors piped in series. Single headers are hard coupled with 95 5 solder.

STORAGE TANK

The storage tank and auxilary heater is not included.

HEAT EXCHANGER

No heat exchanger is used, system operates with potable water circulated directly through the collectors.

PUMP

A Grundfos 25-42 pump is used in the collector loop. Maximum operating temperature is 110 °C ; maximum operating pressure is 998 kPa.

CONTROLLER

An Independent Energy C-30 controller is used to measure the temperature difference between the absorber plate and the tank. Temperature differentials are factory set at 4 °C on and 2°C off. Temperature sensors are thermistor type.

OTHER COMPONENTS

Tempering valve is used for over heat protection. Frost valve is used for freeze protection.

ADDITIONAL NOTES

None.

NORSUN, P O Box 266
Manotick, Ontario, K0A 2N0, (613) 692-2513

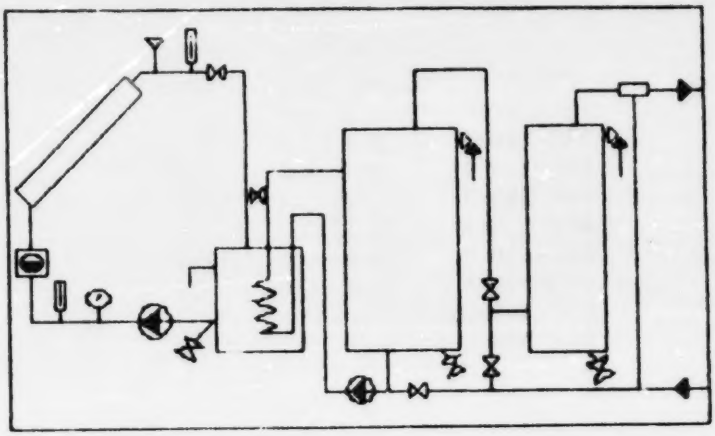
SRA APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN DRAIN BACK

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
DB-225	2(a)	4.5	240
DB-300	2(b)	6.0	330
DB-300	3(b)	9.0	360



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to three single glazed, liquid flat plate collectors as noted. (a) 2.25 m^2, 4'x6', SCIM or ESV; (b) 3.0 m^2, 4'x8', CIM or ECIM

STORAGE TANK (SOLAR PREHEAT/ DRAIN BACK TANK)

Thedrain back tank is an epoxy, fiberglass tank manufactured by Petro-Sun with a capacity of either 60 or 90 litres depending on the system size. The solar preheat tank is not supplied by Petro-Sun and can be any standard electrical hot water tank.

HEAT EXCHANGER

An immersed coil heat exchanger is used in the drain back tank.

PUMP

A Grundfos UP25-18 pump is used in the collector loop. A Taco 006B is used in the DHW loop.

CONTROLLER

A Heliotrope General controller is used to measure the temperature difference between the collector outlet and the storage tank. Optional controller is a ThermoSolar TS-50 or an Independent Energy C-30.

OTHER COMPONENTS

The system also consists of: isolation valves, fill/drain valve, sightglass, flowmeter, thermometer, elapsed time meter KWH meter and tempering valve.

ADDITIONAL NOTES

Over temperature protection factory set at 60 °C in the controller.

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670-8043

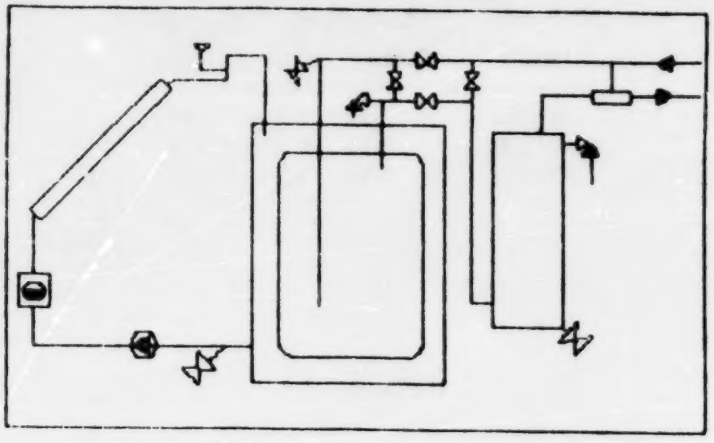
SPO APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN DRAIN BACK

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
DBII-225-3	2(a)	3.6	250
DBII-225-1	2(b)	4.5	250
DBII-225-2	2(c)	4.5	250
DBII-300-1	3(a)	5.5	250
DBII-300-2	2(d)	6.0	250
DBII-300-3	2(e)	6.0	250
DBII-300PLUS-2	4(a)	7.3	250
DBII-300PLUS-1	3(e)	9.0	250



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to four single glazed, liquid flat plate collectors as noted. (a) 1.82 m^2, 3'x6.5', STM; (b) 2.25 m^2, 4'x6', ESV; (C) 2.25 m^2, 4'x6', SCIM; (d) 2.99 m^2, 4'x8', ECIM; (e) 3.0 m^2, 4'x8', CIM

STORAGE TANK (SOLAR PREHEAT/DRAINBACK TANK)

The storage tank is a Thermo Solar Drain Back II tank of tank-in-tank design. The inner tank is stainless steel. Inner tank is rippled to improve heat transfer. Volume of internal tank is 110 litres, volume of external tank 250 litres, drain back volume is 140 litres.

HEAT EXCHANGER

A tank-in-tank heat exchanger is used.

PUMP

A Grundfos UP25-18 pump is used in the collector loop. Optional pump is a Taco 006B.

CONTROLLER

A Heliotrope General controller is used to measure the temperature difference between the collector outlet and the storage tank. Optional controller is a ThermoSolar TS-50.

OTHER COMPONENTS

The system also consists of: isolation valves, fill/drain valve, sightglass, flowmeter and tempering valve.

ADDITIONAL NOTES

Over temperature protection factory set at 60 °C in the controller.

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670-8043

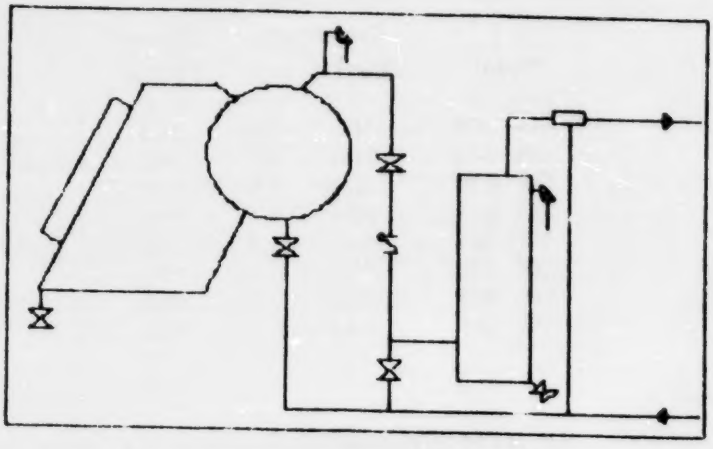
SRC APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

PETRO-SUN THERMOSYPHON

STATUS: ***PROTOTYPE***

Model	Collectors Quant	Area	Storage Litres
TSWH-2-200	1(a)	2.25	182
TSWH-3-200	1(b)	3.0	182
TSWH-3-300	1(b)	3.0	273



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of one of either (a) 4'x6' ESVT or ESHT or (b) 4'x8' ECVT or ECHT as noted above.

STORAGE TANK (SOLAR PREHEAT)

A GSW glass lined steel tank is used with 50 mm urethane insulation. The tank is 610 mm in diameter by 1270 mm in height and has a capacity of 182 l. The larger tank is 660 mm by 1520 mm in height and has a capacity of 273 l.

HEAT EXCHANGER

No heat exchanger is used.

PUMP

No pump is used.

CONTROLLER

No controller is used.

OTHER COMPONENTS

Safety valves and tempering valves are supplied by the installer.

ADDITIONAL NOTES

This is a seasonal system approved for use on a prototype basis only for that portion of thew year when the average ambient temperature is greater than 5 °C.

PETRO-SUN INTERNATIONAL INC., 2290 de la Metropole
Longueuil, Quebec, J4G 1E6, (514) 670-8043

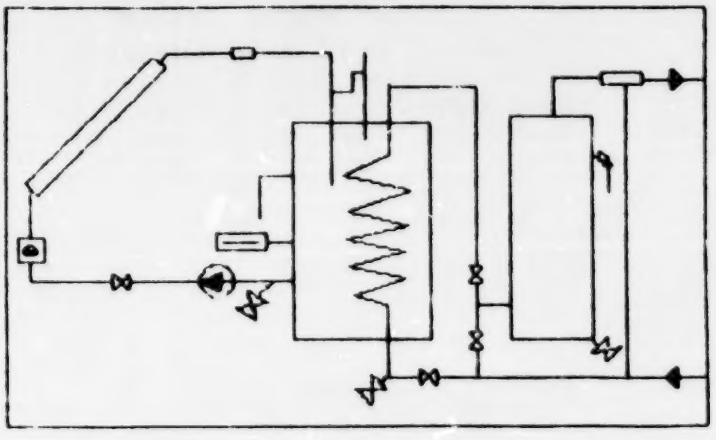
SRCC APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLARSYSTEMS DRAIN BACK

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
SOL-808	1(a)	1.8	263
SOL-809	1(b)	2.2	263
SOL-810	2(a)	3.5	263
SOL-821	2(b)	4.4	263
SOL-831	3(a)	5.3	263
SOL-841	3(b)	6.6	263
SOL-851	4(a)	7.0	450
SOL-850	4(b)	8.8	450



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to four SOL-100 collectors as noted (a) SOL-100, 1.75 m^2, 3'x6.5'; (b) SOL-100, 2.21 m^2, 3'x8'

STORAGE TANK (SOLAR PREHEAT/DRAINBACK TANK)

A polyethylene atmospheric tank, 450 litres and 263 litres, manufactured by Solarsystems (SOL-710). The 263 litre tank is insulated to a UA = 0.897 W/C and the 450 litre tank to UA = 1.165 W/C.

HEAT EXCHANGER

An internal demand type heat exchanger coiled inside the storage tank. This heat exchanger consists of a 3.048 m copper coil of 22.23 mm tubing.

PUMP

A Richdel R - 798 pump is used in the collector loop. Optional pumps are Taco 009 or Grundfos UP26-64F

CONTROLLER

Controller is a Solarsystems SOL-900 differential temperature controller.

OTHER COMPONENTS

The system also consists of: isolation valves, a flow control valve, fill/drain valve, combination sightglass and flowmeter. Tempering valve is optional.

ADDITIONAL NOTES

Over temperature protection factory set at 60 °C in the controller.

SOLARSYSTEMS INDUSTRIES LTD., 2-11771 Horseshoe Way
Richmond, British Columbia, V7A 4S5, (604) 271-2621

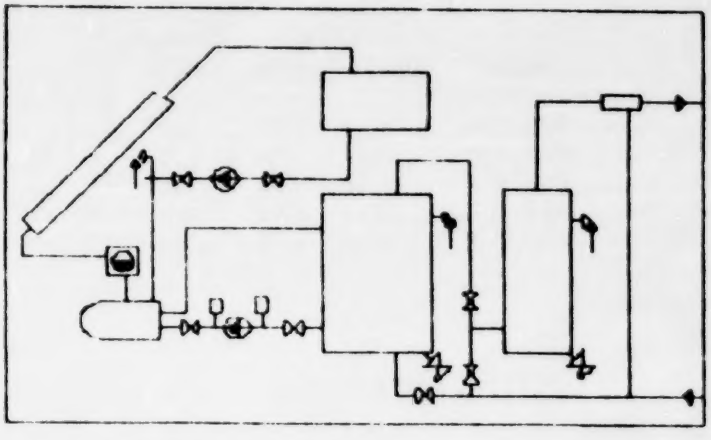
SPB APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLARTECH DRAIN BACK

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
DB-1	2(a)	3.94	295
DB-1	3(a)	5.91	295
DB-1	2(b)	5.94	295



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to three collectors as noted (a) S-37, 1.96 m^2, 3'x7' or (b) S-48, 2.97 m^2, 4'x8'

STORAGE TANK (SOLAR PREHEAT/DRAINBACK TANK)

Drain back tank is 45 litres. Storage tank is a GSW model SA 270-ES-723; 660 mm diameter, 1520 mm height, 76 mm fiberglass insulation.

HEAT EXCHANGER

The heat exchanger is an external shell and tube type manufactured by American Standard model # BCF #5-030-03-014.006.

PUMP

A Grundfos UP25-64F is used in the collector loop. A Grundfos UP25-42SF is used in the potable water loop.

CONTROLLER

Controller is Independent Energy C-30 differential temperature controller. Temperature sensors are thermister type.

OTHER COMPONENTS

Tempering valve is included. All other valves and safety equipment is supplied by the installer.

ADDITIONAL NOTES

None.

SOLARTECH LTD., 700 Gordon Baker Road
Willowdale, Ontario, M2H 3B4, (416) 495-1416

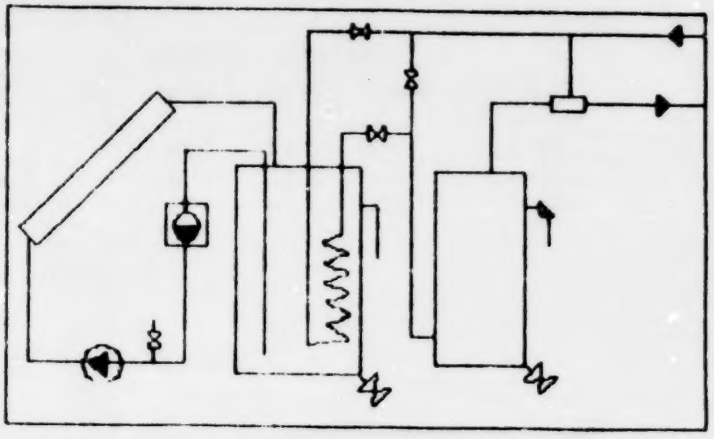
SPG APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLARTECH DRAIN BACK

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
DBS-1-1L	1(a)	2.97	200
DBS-1-2	2(b)	3.94	200
DBS-1-3	3(b)	5.91	200
DBS-1-2L	2(a)	5.94	200
DBS-1-3L	3(a)	8.91	200



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to three collectors as noted (a)S-48, 2.97 m^2, 4'x8' or (b) S-37, 1.96 m^2, 3'x7'

STORAGE TANK (SOLAR PREHEAT/DRAINBACK TANK)

A polyethylene atmospheric tank, 200 litres, manufactured by Solartech (DBST200). The tank is 550mm in diameter, 875 mm height, 75 mm of fiberglass insulation.

HEAT EXCHANGER

An internal demand type heat exchanger coiled inside the storage tank. This heat exchanger consists of a 18.3 m copper coil of 22.23 mm tubing.

PUMP

A Richdel R - 798A pump is used in the collector loop. Optional pumps are Taco 0098F.

CONTROLLER

Controller is independent Energy C-30 differential temperature controller. Temperature sensors arethermistor type.

OTHER COMPONENTS

Tempering valve is included. All other valves and safety equipment is supplied by the installer.

ADDITIONAL NOTES

Over temperature protection factory set at 60 ^{0}C in the controller. Tank sensor is at the bottom.

SOLARTECH LTD., 700 Gordon Baker Road
Willowdale, Ontario, M2H 3B4, (416) 495-1416

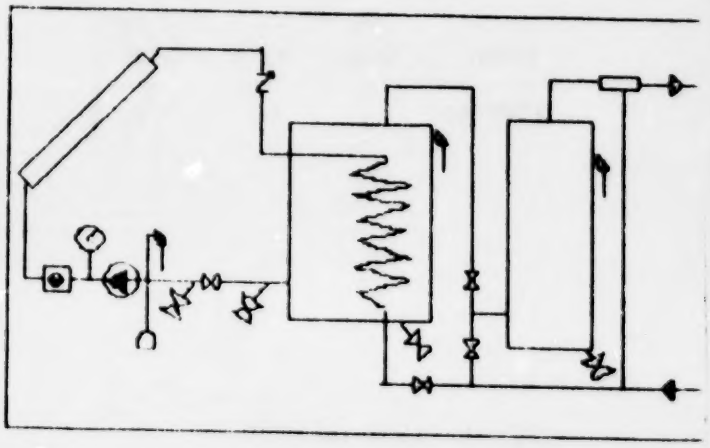
SPD APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLCAN CLOSED LOOP

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
CL- 3.5 -250	2(a)	3.5	246
CL- 4.5 -250	2(b)	4.5	246
CL- 4.5 -250E	2(b)	4.5	246(SPS)
CL-5.25-250	3(a)	5.3	246
CL-5.25-250E	3(a)	5.3	246(SPS)
CL-5.25-300	3(a)	5.3	303
CL-6.75-300	3(b)	6.8	303
CL-6.75-300E	3(b)	6.8	303(SPS)
CL- 7.0 -300	4(a)	7.0	303
CL- 9.0 -300	4(b)	9.0	303



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to four collectors of either (a) 3001S, 1.75 m^2, 3'x6.5' or (b) 3001L, 2.25 m^2, 3'x8'.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a Ford model TC65-15SW (246 litres) or a model TC80-20SW (303L) as noted with internal immersed coil heat exchanger.

HEAT EXCHANGER

An internal immersed coil is used. Heat exchanger is 11.6 m long in the 246 litre tank and 15.6 m long in the 303 litre tank. Both exchangers use 19 mm O.D. copper tubing.

PUMP

A Grundfos UPS 20 - 42 pump is used in the collector loop.

CONTROLLER

A Delta T model DTT80 differential temperature controller is used. Optional controller is an Independent Energy C-30.

OTHER COMPONENTS

Flair expansion tank; option is Extrol. The system also includes safety valves in the solar loop and at the storage tank.

ADDITIONAL NOTES

Overheat protection is in the controller and is factory set at 60°C. Check valve against reverse thermosyphoning in the solar loop.

SOLCAN LTD., RR#3
London, Ontario, N6A 4B7, (519) 473-0501

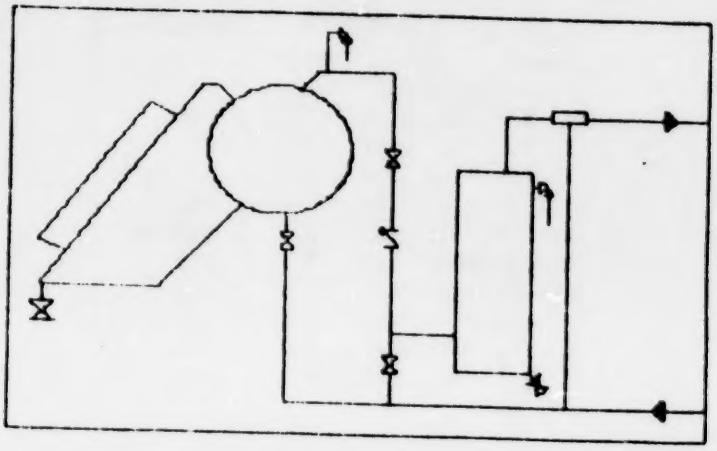
SPO APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLCAN THERMOSYPHON

STATUS: *PROTOTYPE*

Model	Collectors Quant	Collectors Area	Storage Litres
TS40-40	2	3.5	186



SYSTEM COMPONENTS

COLLECTORS

The collector array consists two Solcan model 2005, 1.76 m^2, 3'x6.5'. The model 3001S collector, 1.75 m^2, 3'x6.5' is optional.

STORAGE TANK (SOLAR PREHEAT)

Any glass lined steel tank or galvanized steel tank can be used in this system.

HEAT EXCHANGER

No heat exchanger is used.

PUMP

No pump is used.

CONTROLLER

No controller is used.

OTHER COMPONENTS

Safety valves are supplied by the installer. Tempering valves are supplied by the installer.

ADDITIONAL NOTES

This is a seasonal system approved for use on a prototype basis only for that portion of the year when the average ambient temperature is greater than 5 °C.

SOLCAN LTD., RR#3
London, Ontario, N6A 4B7, (519) 473-0501

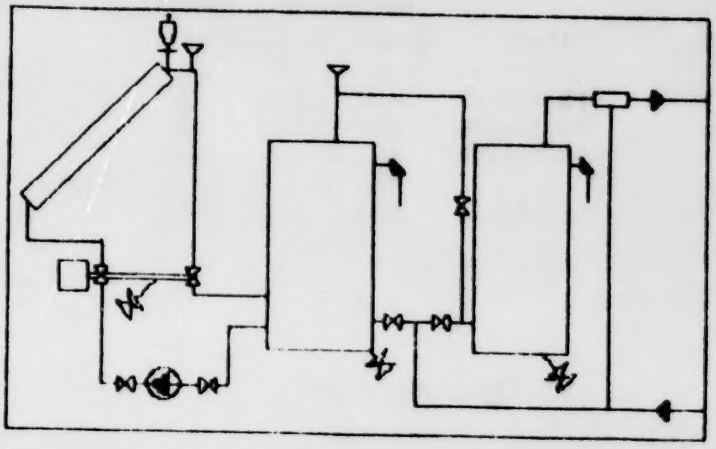
SRA APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLCAN DRAIN DOWN

STATUS: *PROTOTYPE*

Model	Collectors Quant	Area	Storage Litres
DD150-1L	1(a)	2.3	181
DD150-2S	2(b)	3.5	181
DD150-2L	2(a)	4.5	181
DD225-2L	2(a)	4.5	272
DD300-3S	3(b)	5.3	272
DD225-3L	3(a)	6.8	272



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of one to three collectors of either (a) 3001L, 2.25 m^2, 3'x8' or (b) 3001S, 1.75 m^2, 3'x6.5' .

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a John Wood glass lined steel tank, 610 mm in diameter, 1270 mm high, with 50 mm of urethane insulation for the 181 litre tank. The 272 litre tank is 660 mm in diameter, 1520 mm high, with 50 mm of urethane insulation.

HEAT EXCHANGER

No heat exchanger is used, the potable water is circulated through the collectors.

PUMP

A S. A. Armstrong model S-15 five speed pump is used in the collector loop.

CONTROLLER

A Delta T model DTT80 differential temperature controller is used. Optional controller is an Independent Energy C-30.

OTHER COMPONENTS

The drain down valve is manufactured by Sunspool. The system includes safety valves on the storage tank.

ADDITIONAL NOTES

Overheat protection is by using a tempering valve supplied by the installer.

SOLCAN LTD., RR#3
London, Ontario, N6A 4B7, (519) 473-0501

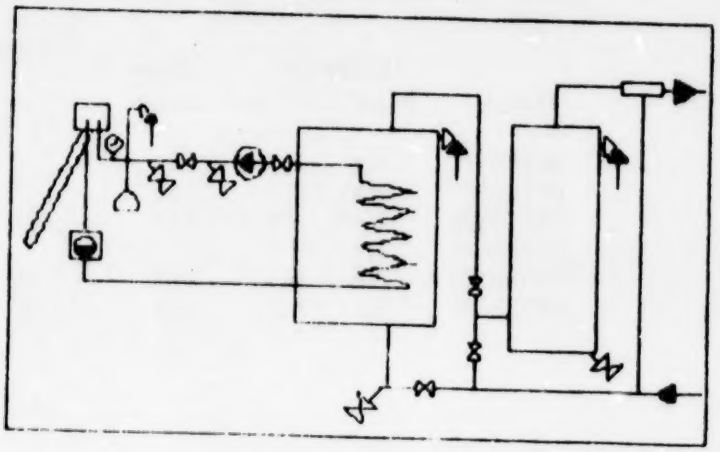
SPG APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOL-PRO CLOSED LOOP

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
ES-100-12	1(a)	1.95	100
ES-100-16	2(b)	2.60	100
ES-100-20	1(a) + 1(b)	3.26	100
ES-100-24	2(a)	3.91	200



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of one or two collectors of either (a) 12, 6' tubes, 1.95 m^2, model Sol-Pro E-100-12 or (b) 8, 6' tubes, 1.3 m^2 model Sol-Pro E-100-8.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a John Wood glass lined steel tank model #30, 510 mm diameter, 860 mm in height with 76 mm of fiberglass insulation and a volume of 100 litres.

HEAT EXCHANGER

An internal immersed coil is used manufactured by Sol-Pro from copper tubing.

PUMP

A Grundfos UPS 20 - 42F pump is used in the collector loop.

CONTROLLER

The system is controlled by use of a timer model Micro Rex QT by Davis Controls Ltd.

OTHER COMPONENTS

Flair Flexmatic expansion tank. The system also includes safety valves in the solar loop and at the storage tank.

ADDITIONAL NOTES

Overheat protection is by a tempering valve on the DHW delivery. Check valve against reverse thermosiphoning in the solar loop.

LES INDUSTRIES HENRI MITCHELL LTEE., 5368-13e, Rosemont
Montreal, Quebec, H1X 2X8, (514) 725-9564

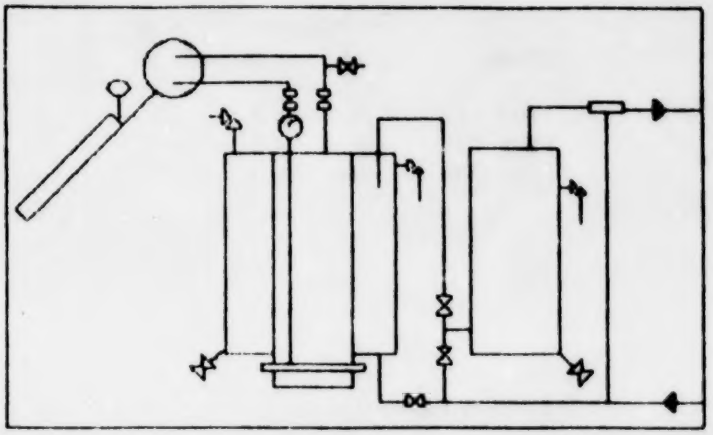
SRC APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLTRAC REFRIGERENT

STATUS: *PROVISIONAL*

Model	Collectors Quant	Collectors Area	Storage Litres
PCF 190-2	2	5.3	190
PCF 290-4	4	10.6	290



SYSTEM COMPONENTS

COLLECTORS

The system size varies from either 2 or 4 Soltrac model 2.5 MSS , 2.64 m^2, 3.5'x8.5' glazed refrigerent collectors.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a John Wood residential gas heater.

HEAT EXCHANGER

The heat exchanger is located inside the solar storage tank and is made using a modified chimney of a standard residential gas water heater.

INJECTOR

A thermodynamic injector manufactured by Soltrac uses a 400W electric heater as an external source of energy. The injector is located under the storage tank.

CONTROLLER

A photo resister cell controlls the injector. The photo cell activates the injector when the sun intensity is is sufficient to justify the system operation. Turn on insolation for the system is 150 W/m^2.

OTHER COMPONENTS

By pass valves, tempering valves and PT relief valves are supplied by the installer.

ADDITIONAL NOTES

Overheat protection is by a thermostat in the tank set to 60°C

SOLTRAC INC., 2270, 46e Ave.
Lachine, Quebec, H8T 2P3, (514) 631-9800

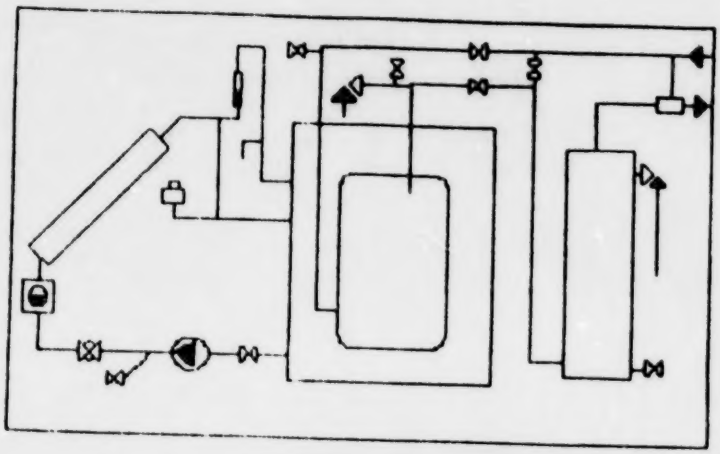
SRA APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLWAY DRAIN BACK

STATUS: ***PROVISIONAL***

Model	Collectors Quant	Area	Storage Litres
TTDB-150	1(a)	3.0	410
TTDB-225	2(b)	4.5	410
TTDB-300	2(a)	6.0	410



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of one or two single glazed, liquid flat plate collectors as noted. (a) SAS-8, 3.0 m^2, 4'x8' or (b) SAS, 2.25 m^2, 4'x6'

STORAGE TANK (SOLAR PREHEAT/DRAINBACK TANK)

The storage tank is a Sol-Way model SST-160 tank-in-tank design. The inner tank is stainless steel. Outer tank is polyetylene.

HEAT EXCHANGER

A tank-in-tank heat exchanger is used. Volume of internal tank is 160 litres, volume of external tank 410 litres, drain back volume is 250 litres.

PUMP

A Richdel model R798A pump is used in the collector loop. Optional pumps include Hartell, Little Giant,and Grundfos.

CONTROLLER

An Independent Energy model C-30 controller is used to measure the temperature difference between the collector outlet and the storage tank. The differentials are set at 7°C on, 2°C off. Temperature sensors are thermistor type.

OTHER COMPONENTS

A low level switch is supplied with the system to stop the pump if there is insufficient water in the solar loop. The system also consists of: isolation valves, fill/drain valve, sightglass, flowmeter and tempering valve which are supplied by the installer.

ADDITIONAL NOTES

Collectors are approved for flush mount only. Over temperature protection factory set at 60 °C in the controller.

SOL-WAY ENERGY CORP., 942 S. W. Marine Dr., Suite 30
Vancouver, British Columbia, V6P 5Z2, (604) 324-3327

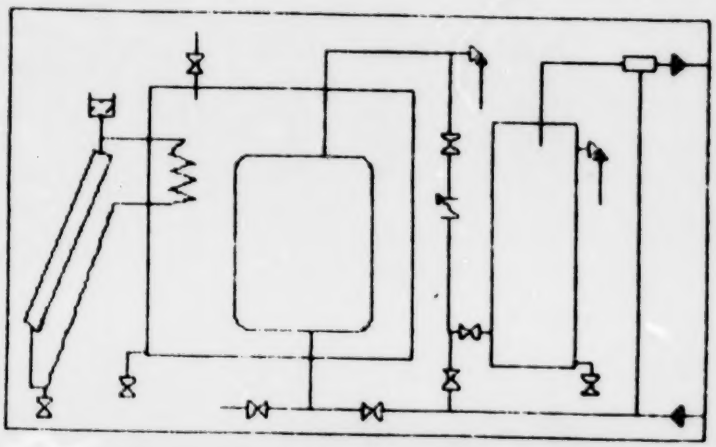
SPB APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SOLWAY THERMOSYPHON

STATUS: *PROTOTYPE*

Model	Collectors Quant	Collectors Area	Storage Litres
TH-6	2	6.0	410
TH-9	3	9.0	410
TH-12	4	12.0	410



SYSTEM COMPONENTS

COLLECTORS

The collector array consists two to four Solway model SAS-8, 3.0 m^2, 4'x8' collectors.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a Solway PET-410 high density polyethylene tank with a 160 litre stainless steel inner tank.

HEAT EXCHANGER

The heat exchanger system consists of a tank-in-tank design to heat the potable water in the stainless steel inner tank and an immersed coil to transfer the heat from the glycol mixture in the collectors to the water in the larger outer tank.

PUMP

No pump is used.

CONTROLLER

No controller is used.

OTHER COMPONENTS

Bypass, PT relief and tempering valves supplied by the installer.

ADDITIONAL NOTES

This is a seasonal system approved for use on a prototype basis only for that portion of thew year when the average ambient temperature is greater than -5 °C. Anti-freeze is used in the solar loop.

SOL-WAY ENERGY CORP., 942 S. W. Marine Dr., Suite 30
Vancouver, British Columbia, V6P 5Z2, (604) 324-3327

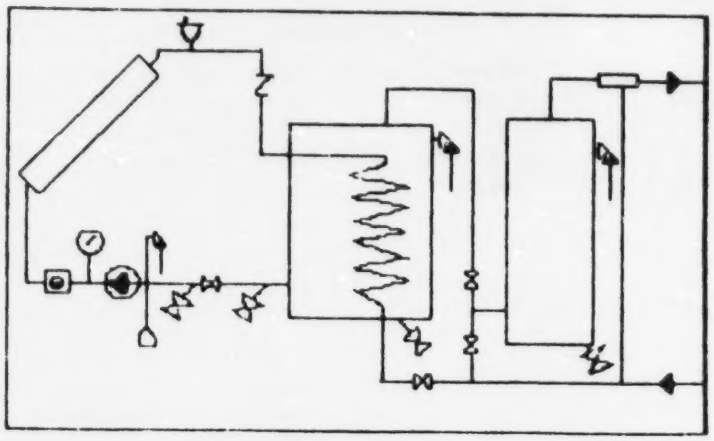
SPO APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SUN RAY CLOSED LOOP

STATUS: *PROVISIONAL*

Model	Collectors Quant	Collectors Area	Storage Litres
SR-CL-A	2(a)	3.8	246
SR-CL-B	2(b)	5.9	303
SR-CL-C	3(b)	8.8	303



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to three collectors of either (a) 37 - series, 1.9 m^2, 3'x7' or (b) 48 - series, 2.93 m^2, 4'x8' as noted.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is a Ford model TC65-15SW (246 litres) or a model TC80-20SW (303L) as noted with internal immersed coil heat exchanger.

HEAT EXCHANGER

An internal immersed coil is used. Heat exchanger is 11.6 m long in the 246 litre tank and 15.6 m long in the 303 litre tank. Both exchangers use 19 mm O.D. copper tubing.

PUMP

A Taco 008V pump is used in the collector loop.

CONTROLLER

The controller is an Independent Energy model C-30 differential temperature controller. Differentials are set at 11°C on and 3°C off. Temperature sensors are the thermister type.

OTHER COMPONENTS

Extrol S-15 expansion tank. The system also includes safety valves in the solar loop and at the storage tank.

ADDITIONAL NOTES

Overheat protection is in the controller and is factory set at 60°C. Check valve against reverse thermosyphoning in the solar loop.

SUN RAY SOLAR SYSTEMS LTD., 2429 Seminole Street
Windsor, Ontario, N8Y 1X2, (519) 253-1182

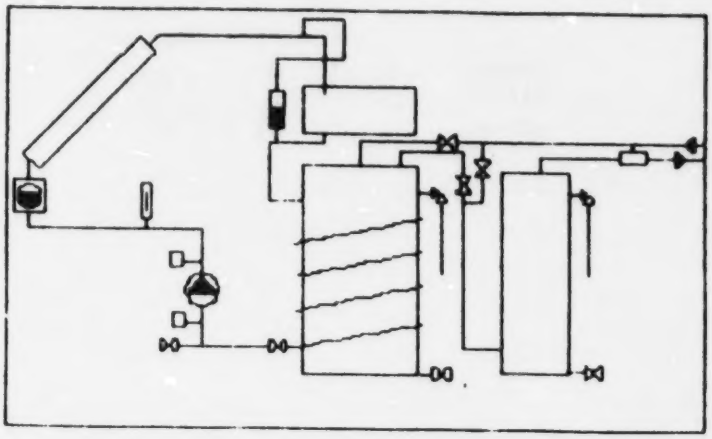
SPG APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SUN RAY DRAIN BACK

STATUS: *PROVISIONAL*

Model	Collectors Quant	Collectors Area	Storage Litres
SR-DB-1-300	3(a)	5.7	310
SR-DB-2-300	2(b)	5.9	310
SR-DB-3-300	3(b)	8.8	310



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to three collectors of either (a) 37 - series, 1.9 m^2, 3'x7' or (b) 48 - series, 2.93 m^2, 4'x8' as noted.

STORAGE TANK (SOLAR PREHEAT/DRAINBACK TANK)

The storage tank/drainback tank is a Solarcraft Heater model #SCV-82-1TS2. Larger tank is 82 US gallons; storage tank is 8 US gallons.

HEAT EXCHANGER

The heat exchanger is a wrap around on the large storage tank. Heat exchanger area is 1.2 m^2.

PUMP

A Grundfos model UP26-64F pump is used in the collector loop.

CONTROLLER

The controller is a Hi-Square model 1503-C differential temperature controller. Differentials are set at 9°C on and 1.6°C off. Temperature sensors are the thermister type.

OTHER COMPONENTS

Both tanks are pre assembled, bypass, PT relief and tempering valves are supplied.

ADDITIONAL NOTES

Overheat protection is in the controller and is factory set at 60°C.

SUN RAY SOLAR SYSTEMS LTD., 2429 Seminole Street
Windsor, Ontario, N8Y 1X2, (519) 253-1182

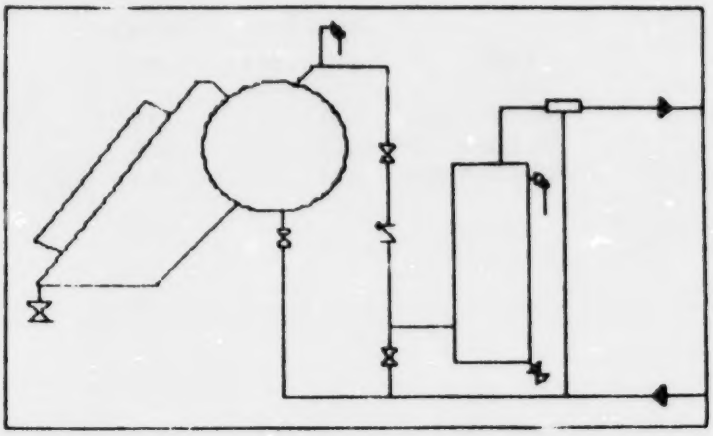
SPB APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

SUN RAY THERMOSYPHON

STATUS: *PROTOTYPE*

Model	Collectors Quant	Collectors Area	Storage Litres
SRT-60	1	3.0	227



SYSTEM COMPONENTS

COLLECTORS

The collector array consists one Sun Ray 48-series, 2.93 m^2, 4'x8' collector.

STORAGE TANK (SOLAR PREHEAT)

A 227 litre, galvanized steel tank with a special coating is used. The tank is equipped with a sacrificial anode.

HEAT EXCHANGER

No heat exchanger is used.

PUMP

No pump is used.

CONTROLLER

No controller is used.

OTHER COMPONENTS

Safety valves are supplied by the installer. Tempering valves are also supplied by the installer.

ADDITIONAL NOTES

This is a seasonal system approved for use on a prototype basis only for that portion of thew year when the average ambient temperature is greater than 5 °C.

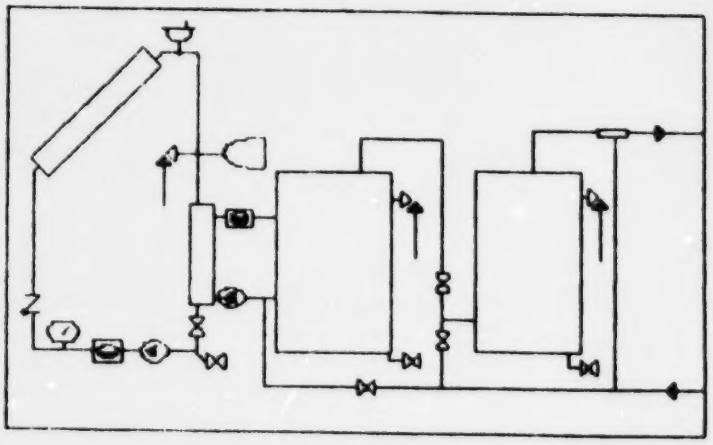
SUN RAY SOLAR SYSTEMS LTD., 2429 Seminole Street
Windsor, Ontario, N8Y 1X2, (519) 253-1182

SPD APPROVED PACKAGED SOLAR SYSTEM

Effective Date: 1 November 1984 (SUPERCEDES 1 JUNE 1984)

THERMODYNAMICS CLOSED LOOP STATUS: *PROVISIONAL*

Model	Collectors Quant	Collectors Area	Storage Litres
TDA-150	2	4.6	182
TDA-225	3	6.9	273
TDA-300	4	9.2	273



SYSTEM COMPONENTS

COLLECTORS

The collector array consists of two to four collectors of ThermDynamics model A22R5, 2.32 m^2, 3'x8' liquid flat plate collectors.

STORAGE TANK (SOLAR PREHEAT)

The storage tank is aglass lined, steel tank manufactured by Rheem Canada. Two volume sizes are used, 182 and 273 litres as noted.

HEAT EXCHANGER

The heat exchanger is a tube-in-shell type connected in a counter flow configuration.

PUMP

A Taco 0068 pump is used in the potable water loop. A Grundfos UPS20-42 pump is used in the collector loop.

CONTROLLER

The controller is an Independent Energy model C-30 differential temperature controller. Differentials are set at 5°C on and 2°C off. Temperature sensors are the thermistor type.

OTHER COMPONENTS

Extrol S-15 expansion tank. The system also includes safety valves in the solar loop and at the storage tank.

ADDITIONAL NOTES

Overheat protection is in the controller and is factory set at 60°C. Check valve against reverse thermosyphoning in the solar loop. Propylene glycol/water mixture is used in the collector loop.

THERMO DYNAMICS INC., 24 Simmonds Dr., Burnside
Dartmouth, Nova Scotia, B3B 1R3, (902) 469-1101

Public Works Canada
Travaux publics Canada

Solar Programs Office
Bureau des programmes solaires

Solar Programs Office

1984 DIRECTORY

Approved Solar Manufacturers
1 June 1984

This document contains an alphabetical listing of all approved solar manufacturers in Canada.

These companies have met all SPO approval requirements and are eligible to participate in Federal Government Solar Demonstration Programs.

Information:

Product Engineering Section
Solar Programs Office
Public Works Canada
Confederation Heights
Ottawa K1A 0M2

R. Saunders (613) 998-3940
B. Tawfik (613) 998-3641
L. Emerton (613) 998-3643

SPO DIRECTORY OF SOLAR MANUFACTURERS

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Company Name:	Asecor Ltd.	
Mailing Address:	Box 929 Manotick, Ontario K0A 2N0	Tel: (613) 692-4495 Telex:
Plant Locations:	1. Rideau Valley Drive Manotick, Ont.	
Company Representatives:	E. Plett, President	
Solar Products:	. Cylindrical Parabolic Concentrator Collector . Louvre insulation system for greenhouse	
Other Products & Services:	. Full range of thermal engineering modelling and analysis . Computer facilities for extensive computer solutions	
Export Activities:	. International marketing of products to India and Africa through affiliation with TPK Solar Systems Inc.	
Major Solar Installations To Date:		

asecor ltd.

Box 929,
Manotick,
Ontario K0A 2N0

Company Name:	Conserval Products A Division of Conserval Engineering Inc.
Mailing Address:	855 Alness Street, Suite 1 Downsview, Ontario M3J 2H8
Tel:	(416) 661-7057
Telex:	
Plant Locations:	1. Downsview, Ont.
Company Representatives:	John C. Hollick, President
Solar Products:	. Solar Air Heating Collectors . Solar Lighting Controls
Other Products & Services:	. Energy management controls . Energy audits and turn key systems . Various energy saving products
Export Activities:	. U.S.A., Carribean, Japan
Major Solar Installations To Date:	. Trent Timber Treating Inc. . Numerous private residences

CONSERVAL PRODUCTS
A Division of Conserval Engineering Inc.

855 ALNESS STREET, SUITE 1, DOWNSVIEW, ONTARIO, CANADA M3J 2H8
TELEPHONE (416) 661-7057

Manufacturers and Distributors of Energy Conservation and Solar Heating Products

SR94/A

Company Name:	General Solar Inc.	
Mailing Address:	Box 281 Carleton Place, Ontario K7C 3P4	Tel: (613) 257-7021 Telex:
Plant Locations:	1. 150 Mill Street Carleton Place, Ontario K7C 3P4	
Company Representatives:	W. Bell, President W. Robertson, Engineering Manager K. Morris, Marketing Manager	
Solar Products:	. Large Scale Site-built Flat Plate Collectors for industrial/commercial applications	
Other Products & Services:	. Energy Audits, Waste Heat Recovery Systems . Computer Simulations, Full Engineering Services . Turn Key Solar Systems - Industrial/Commercial	
Export Activities:	None to date.	
Major Solar Installations To Date:	Inglis Carpet Cleaners - 212 m^2 - Process Air Heating, Ottawa, 1982	

General Solar Inc.

150 Mill Street, P.O. Box 281,
Carleton Place, Ontario K7C 3P4
(613) 257-7021

Company Name:	International Plastics Ltd. (LamCo Division)
Mailing Address:	12180 Vickers Way Richmond, British Columbia V6V 1H9 Telex:
Plant Locations:	1. 1481 Franklin Street Vancouver, British Columbia V5L 1P1
Company Representatives:	J.E. Bradley, President (604) 273-4987 David Bruce, Vice President (604) 253-4351 Brian Jones, General Manager (604) 253-4351
Solar Products	. Refrigerant-filled Systems
Other Products & Services:	. Design and Installation of Refrigerant-filled Systems
Export Activities:	
Major Solar Installations To Date:	

Company Name:	LPC of Canada Ltd.	
Mailing Address:	Box 90 Sprague, Manitoba R0A 1Z0	Tel: (204) 437-2123 Telex:
Plant Locations:	1. Blumenort, Manitoba	
Company Representatives:	Lawrence Nordstrom, President	(204) 437-2316
Solar Products:	. Solar Air Heating Collectors . Solar Air Heating Systems	
Other Products & Services:	. Sales and installation of DHW systems . Sales and installation Residential and Commercial Swimming Pool Systems	
Export Activities:		
Major Solar Installations To Date:	. Harbour Board Machine Shop, Churchill, Manitoba 195 m^2, Space Heating . Community Centre, Meadows, Manitoba 31 m^2, Space Heating . Private homes, Manitoba, Saskatchewan, Alberta numerous 8 m^2 to 20 m^2 space heating systems.	

L P C OF CANADA, LTD.

BOX 90, SPRAGUE, MANITOBA, CANADA. R0A 1Z0

TELEPHONE (204) 437-2123 - (204) 437-2316

Company Name:	Mitchell Industries Ltd.	
Mailing Address:	5368 - 13e Avenue Rsmt Montreal, Que. H1X 2X8	Tel: (514) 725-9564 Telex: 05561709
Plant Locations:	1. Ottawa, Ontario 2. Montreal, Que.	Tel: (613) 722-2795
Company Representatives:	Pierre Fournelle, President Pierre Casgrain, V.P. Marketing Normand Boucher, Engineering	
Solar Products:	. Sol Pro Evacuated Tube Collector E-100 . Sol Pro Closed Loop DHW System ES-100	
Other Products & Services:	. Anodisation . Commercial Aluminium Doors and Windows . Hardware . Sol-Pro Greenhouses	
Export Activities:	. Target Market: United States	
Major Solar Installations To Date:	. Scarborough Town Centre, Government of Canada Building (294 collectors) (E-100-12 tubes UTR 261)	

INDUSTRIES
MITCHELL

SOL-PRO

SR94/A

Company Name:	Norsun	
Mailing Address:	Box 760 Manotick, Ontario K0A 2N0	Tel: (613) 692-2513 Telex: 053-4979
Plant Locations:	1. Century Road Manotick, Ontario	
Company Representatives:	Jim Ramsden, President Ron Wilkinson, Chief Engineer Jim Swartman, Sales Manager Rob Patterson, Sales Engineer Brian Reed, Residential Sales	
Solar Products	. Thermal Diode Collector . Drain Back and closed loop domestic hot water system . Seasonal direct domestic hot water systems (Equinox)	
Other Products & Services:	. Norfin Ultrasomically welded, selectively coated copper fin on copper tube for collector manufacturers . Solar System Design Service . Custom Heat Exchanger Design	
Export Activities:	To Japan, Taiwan, Carribean and United States	
Major Solar Installations To Date:	. South Block Parliament Hill, Ottawa 254 m^2, Cafeteria, Laundry, DHW . Jamaica Broilers, Jamaica 510 m^2, Process Water Heating . Halifax International Airport, Halifax 220 m^2, DHW . RCMP Headquarters, Ottawa 240 m^2, DHW	

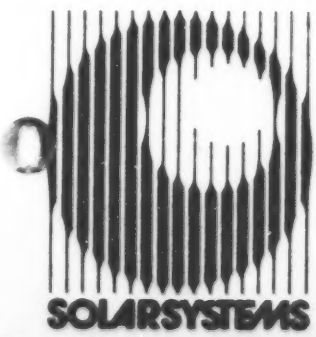
A Division of Nortec Solar Ind. Inc.
P.O. Box 760, Manotick, Ontario, Canada K0A 2N0
Telephone: (613) 692-2513
Telex 053-4979

Company Name:	Petro-Sun International Inc.	
Mailing Address:	2290 de la Metropole Longueuil, Quebec J4G 1E6	Tel: (514) 670-8043 Telex:
Plant Locations:	1. Longueuil, Quebec	
	2. 1501 Ampere Boucherville, Quebec	Tel: (514) 641-1015
	3. 1045 Hargrave Road London, Ontario	Tel: (519) 685-1480
	Ontario Branch	
	24 Queen Street East Suite 608 Brampton, Ontario L6V 1A3	Tel: (416) 454-3020
Company Representatives:	Michel Sicotte Don Halme Michel Kriviky	
Solar Products:	. Flat Plate Medium Temperature Collectors . Plastic Low Temperature Collectors . Sunstrip Selective Solar Absorber . DHW Drain Back, Close Loop and Thermosyphon Systems	
Other Products & Services:	. Commercial Solar Systems . Solar Design and R&D Services	
Export Activities:	. Egypt, India, Kenya and Greece.	
Major Solar Installations To Date:	. Multiple Canadian Government Building Installations, total 9000 m^2 . Multiple MOE Program Installations, Ontario, total 2000 m^2 . Swimming Pool Applications with Low Temperature Collectors, total 40 000 m^2	

PETRO-
INTERNATIONAL INC.

Thermo Solar Division

Company Name:	Solarsystems Industries Ltd.
Mailing Address:	2-11771 Horseshoe Way Richmond, British Columbia V7A 4S5 Tel: (604) 271-2621 Telex: 04-355755
Plant Locations:	1. Richmond, B.C.
Company Representatives:	Erich Hoffman, President Blair D. Salter, V.P. Sales - Export Contact Gord Smith, Dealer Manager Merrill Gordon, Corporate V.P.
Solar Products:	. Flat Plate Collectors (selective coated copper absorber, low iron glass, aluminum frame) . Solar tanks, 100 to 10,000 imperial gallons (fiberglass, plastic, wood/steel, stainless steel) for drain back solar systems . Differential controls and sensors . Selective coatings - black chrome over nickel on copper for absorber plate
Other Products & Services:	. Licensing agreements available for technology transfer in selective coating or product manufacture.
Export Activities:	. Agents and Warehouses across the U.S. . Solarsystems FIJI Ltd. . Han Yang Metal Industries, South Korea
Major Solar Installations To Date:	. National Film Board, Montreal, Que. 650 m^2 DHW . University of Victoria, B.C. 380 m^2 pool heating . Oak Bay Recreation Centre, Victoria, B.C. 325 m^2 pool heating . Department of National Defence, Chilliwack, B.C. 195 m^2 pool heating . Pineridge Elementary School, Kamloops, B.C. 186 m^2 space heating . CMHC, Granville Island, Vancouver, B.C. 177 m^2 space heating . Surrey Data Taxation Centre, 170 m^2 DHW . Province of B.C., 67 DHW systems . EMR Canada, 350 DHW systems . Solchrome, 93 000 m^2 supplied in 1983 to the US . Saudi-Arabia, Yanbu Housing Project 1200 DHW systems



SOLARSYSTEMS INDUSTRIES LTD.
2 - 11771 HORSESHOE WAY,
RICHMOND, B.C. V7A 4S5
TELEPHONE: (604) 271-2621
TELEX: 04- 355755

Company Name:	Solartech Ltd.	
Mailing Address:	700 Gordon Baker Drive Willowdale, Ontario M2H 3B4	Tel: (416) 495-1416 Telex: 06-986766
Plant Locations:	1. Willowdale, Ontario	
Company Representatives:	John Kane, President Richard Copeland, V.P. Engineering	
Solar Products:	. Evacuated Tube Collectors (ETC) . Flat Plate Collectors . Air Collectors . DHW Systems . Solar Industrial Process Heating (IPH) Systems	
Other Products & Services:	. Swimming Pool Systems	
Export Activities:	. Export products are ETC, Flat Plate Collectors and Thermosyphon Systems . Technology transfer, joint ventures and licensing agreements . New Zealand, Lebanon, Jordan, Spain, Greece, Italy and France . Subsidiary in U.S.: Sun Master Corp., Corning, N.Y.	
Major Solar Installations To Date:	. South Central Letter Processing Plant, Toronto 292 m^2, DHW . Mountain Springs Beverage Co., Edmonton, 282 m^2, Bottle Washing . CN Train Car Wash, Edmonton, 270 m^2 . Confederation Heights Cafateria, PWC, Ottawa, 96 m^2, DHW (ETC) . Nepean Sportsplex, Ottawa, 182 m^2, DHW (ETC) . MacDonald Restaurants, Ontario, 96 m^2, Flat Plate DHW . Picton Retardation Centre, Picton, Ontario, 460 m^2, Air Flat Plate,	

Company Name:	Solcan Ltd.	
Mailing Address:	R.R. Number 3 Sarnia Gravel Road London, Ontario N6A 4B7	Tel: (519) 473-0501 Telex:
Plant Locations:	1. London, Ontario	
Company Representatives:	R.K. Swartman, President P. Swartman, Marketing Manager W. Dobbin, Project Engineer	
Solar Products	. Flat Plate Collectors . Finned Tube Solar Collector . DHW Systems . Solar Greenhouses	
Other Products & Services:	. Professional Engineering Services in Ontario and Nova Scotia	
Export Activities:	. Thermosyphon Systems to Kenya, Sudan, Pakistan, India, Sri Lanka. . Affiliated with Passmore Associates International, Ottawa . Affiliated with Najmi Karmali (CDC) Ltd. Nairobi, Kenya. . Affiliated with Pedacon Consultants, Lagos, Nigeria.	
Major Solar Installations To Date:	. Dominion Public Bldg., London, Ontario, 54 m^2, DHW . Building T118 CFB Borden, Ontario, 77 m^2, DHW . Building A151 CFB Borden, Ontario, 176 m^2, DHW . Adventist University of East Africa Kenya, 84 m^2, Thermosyphon . Ridgetown Nursing Home, Ontario, 135 m^2, DHW	

SOlcan Ltd

Company Name:	Soltrac Inc.	
Mailing Address:	2270 46e Avenue Lachine (Québec) H8T 2P3	Tel: (514) 631-9860 Telex: 055 61139
Plant Locations:	1. Lachine (Québec)	
Company Representatives:	Jean Pichette, Sales and Marketing Manager Pierre Boisvert, Research and Development Director	
Solar Products	. Refrigerant Phase Change Domestic Hot Water Systems	
Other Products & Services:	. Additional components used with system for: - Swimming pool - Space heating . Industrial and commercial systems . Solar design . Control . Research and Development	
Export Activities:	. Technology Transfer . Solar system	
Major Solar Installations To Date:		

Soltrac inc.
2270 - 46e avenue,
Lachine, Qué.
H8T 2P3
(514) 631-9860

Company Name:	Solway Energy Corporation
Mailing Address:	30-942 S.W. Marine Drive Vancouver, British Columbia V6P 5Z2
Telephone:	Tel: (604) 324-3327 Telex: 04-352848 VCR
Plant Locations:	1. Vancouver, B.C.
Company Representatives:	J.L. Richardson, P. Eng., President Gary Way, C.E.T.
Solar Products:	. Low Cost Passive Solar Water Heaters . Solar Hot Water Collectors and Drainback Systems . High Temperature Concentrating Solar Collectors for Process and Air Conditioning . Photovoltaic Pumping Systems . 12 V lighting systems
Other Products & Services:	. Hot Water Radiant Heating Panels for Commercial Buildings . Consulting Engineering Design Services
Export Activities	Being initiated.
Major Solar Installations To Date:	. Grandview Apartments, Vancouver, B.C. . Kitsun Apartments, Vancouver, B.C.

SOLWAY ENERGY CORPORATION

30 - 942 SOUTHWEST MARINE DRIVE VANCOUVER BRITISH COLUMBIA CANADA V6P 5Z2

PH (604) 324-3327 · CABLE SOLENCORP · TELEX 04-352848 VCR

Company Name:	Sunglo Solar Ltd.	
Mailing Address:	35 Citron Court Concord, Ontario L4K 2S7	Tel: (416) 738-0300 Telex: 06-964609
Plant Locations:	1. Concord, Ontario	
Company Representatives:	Joe Sherman, President Jack Stewart, Manager Dan Jones, Engineer Dan Wickham, Sales Manager	
Solar Products	. Flat Plate Plastic Collector	
Other Products & Services:	. Computer Sizing Studies . Design & Engineering Services	
Export Activities:	. Distribution to U.S. and Europe	
Major Solar Installations To Date:	. Various Residential and Commercial Solar Installations	

SUNGLO SOLAR LTD

35 CITRON COURT, CONCORD, ONTARIO, CANADA L4K 2S7 TEL. (416) 738-0300 TELEX 06-964609

Company Name:	Sun Ray Solar Systems Ltd.	
Mailing Address:	2429 Seminole Street Windsor, Ontario N8Y 1X2	Tel: (519) 253-1182 Telex:
Plant Locations:	1. Windsor, Ontario	
Company Representatives:	Earl Pattison, President Brian Rankine, General Manager	
Solar Products:	. Flat Plate Collector . DHW Systems . Thermosyphon Hot Water Systems	
Other Products & Services:	. Insulated glass windows . Solar System Design . Complete Turn Key Solar Projects	
Export Activities:	. U.S.A. . Carrebian Basin . India	
Major Solar Installations To Date:	. McComb Community College, Detroit, USA, 650 m^2 DHW and Space Heating . University Hospital of West Indies, Jamaica, 600 m^2 DHW . Canadian Embassy, New Delhi, India, 400 m^2, DHW and Space Air Conditioning . Assorted Canadian Federal Buildings . Assorted Commercial Projects . Residential Domestic Hot Water System.	

Sun Ray Solar Systems Ltd.
2429 Seminole St., Windsor, Ontario, Canada N8Y 1X2
Telephone (519) 253-1182

SUN RAY™

Company Name:	Thermo Dynamics Ltd.	
Mailing Address:	24 Simmonds Drive, Burnside Dartmouth, Nova Scotia B3B 1R3	Tel: (902) 469-1101 Telex:
Plant Locations:	1. Dartmouth, N.S.	
Company Representatives:	Peter Allen, President James Allen, Plant Manager	
Solar Products:	. Flat Plate Collector . DHW Systems	
Other Products & Services:	. Low Iron Thermopane Units . System Designers and Contractors . Heat Reclaimers	
Export Activities:	. Solar collectors and miscellaneous Solar hardware exported to the Middle East.	
Major Solar Installations To Date:	. Maritime Color Labs, Dartmouth, N.S. 46 m^2 (process hot water) . Cobequid Apartments, Sackville, N.S. 46 m^2 (domestic hot water)	

THERMO DYNAMICS LTD.

"Solar Energy Systems"

SR94/A

Company Name:	Watershed Energy Systems Ltd.	
Mailing Address:	97 Six Point Road Toronto, Ontario M8Z 2X3	Tel: (416) 233-3241 Telex: 226 5553
Plant Locations:	1. Toronto, Ontario	
Company Representatives:	Doug Hart, President Ian Hamilton, Project Manager, Engineering Anneclaire LeRoyer, Marketing Michael Ruttan, Controller/Technologist	
Solar Products:	. Flat Plate Collectors . Air Collectors . DHW Systems . Solar Monitoring Equipment	
Other Products & Services:	. Design Services	
Export Activities:	. Exports to U.S. . Solar Control and Monitoring Systems	
Major Solar Installations To Date:	. Downsview CFB, Toronto, 1100 m^2, Space Heating . Kingston Regional Laundry, Kingston 300 m^2, Laundry Water Preheating . Private Resort, Utah, USA 180 m^2, Space Heating and DHW . North York Community Centre 175 m^2, Space Heating	

watershed

POOR

QUALITY

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